THE

MECHANICS' MAGAZINE.

JANUARY 3RD—JUNE 27TH, 1857.

EDITED BY R. A. BROOMAN.

VOL. LXVI.

"It is certainly true, that as man approaches nearer to the highest end of his existence, it must constantly become easier for him to satisfy his sensual wants—that his physical existence must cost him less labour and care; an innumerable multitude of new discoveries and inventions be made to diversify and facilitate the means of subsistence. .... Nature is rude and savage without the hand of man; and it should be so, that thereby man may be forced to leave his natural state of inactivity, and elaborate her stores; that thereby he himself, instead of a mere product of nature, may become a free, reasonable being. He does most certainly leave it; he plucks at all hazards the apple of knowledge, for the impulse is indestructibly implanted within him, to be like God. .... There is no salvation for man until his natural sluggishness is successfully combated—until he finds all his pleasures and enjoyments in activity, and in activity alone."—FICHTE.

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1857.

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TO THE SIXTY-SIXTH VOLUME.

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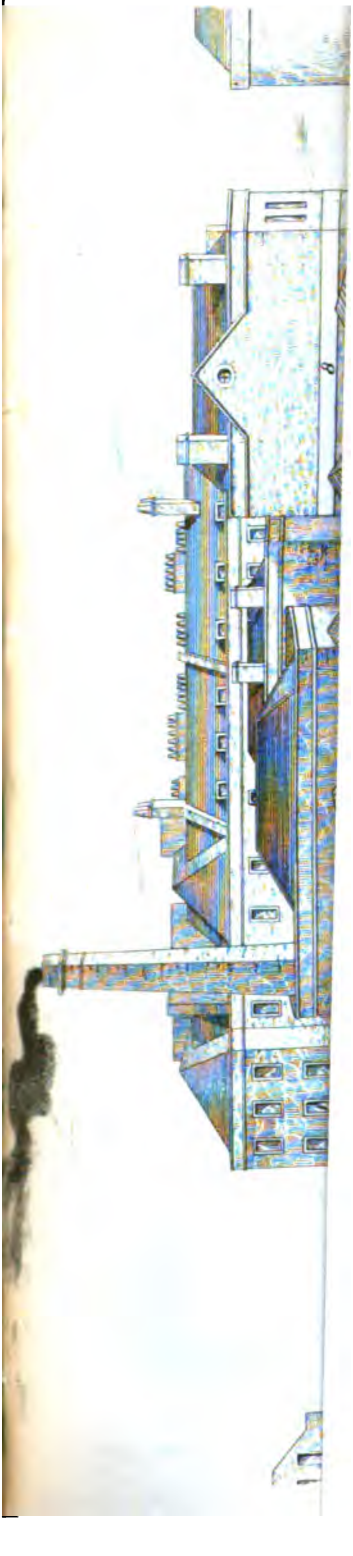

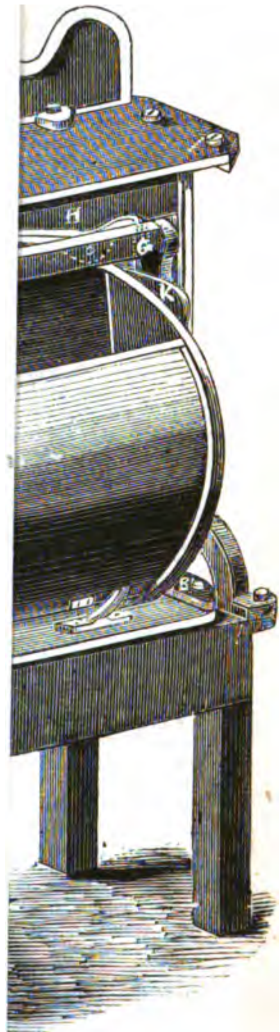

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Mechanics' Magazine.

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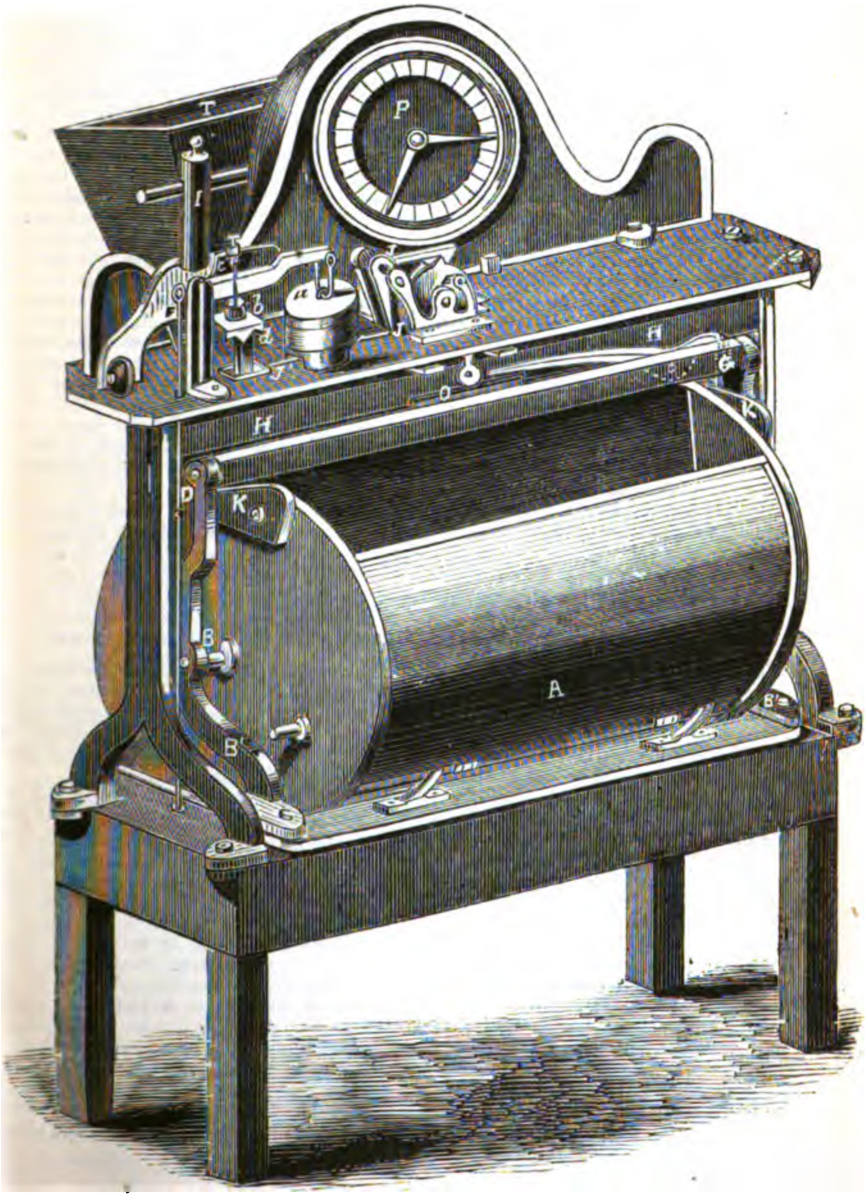
SELF-ACTING GRAIN SCALE.



SELF-ACTING GRAIN-SCALE.

A description of this invention will be found in our number for Saturday, December 20th, 1856; we now give an engraving and detailed description of the same. A is the drum, divided longitudinally through the centre by a diaphragm, and suspended by bearings and standards, B B′, on a platform scale, C, connected by a rod, D, to the beam, F. The grain or other substance to be weighed enters from above and behind the machine, and passing from the hopper, T, falls into one side of the drum, which is held in position by a bolt, G. There are two weights on the beam, *a* and *b*, and we will suppose that the quantity to be weighed and discharged at each oscillation of the drum is a sack of 280 lbs.; 275 lbs. are placed on the beam at *a*, and the weight *b* is held over the notch of 5 in the beam by a forked thumb screw, C. This latter weight rests on a small platform, *d*, attached to the gate, H, and does not touch the beam until the 275 lbs. weight of grain have entered the drum. The beam then rises, the trip lever, I, falls over, releasing the gate, H, at *e*, by striking the bell crank catch lever, J, through the rod, J′, and it falls, taking with it the small stand in which the weight, *b*, rested, cutting off the main supply of grain, and leaving a small space, O, through which the grain continues to run until the 5 lbs. are added. The beam then indicates 280 lbs., and rises; the trip lever again falls over, releasing the small gate, O, from its catch on the second disc behind E, to which it is attached, and it falls, stopping the supply of grain. At the same moment, by the fall of the second gate, the bolt, G, is withdrawn, and the weight of the grain being on one side of the drum, it rolls over, and by means of the cams, K K, on its periphery, it raises the gates, and the other side begins to fill in like manner. At the same time a trap at the lower side of the drum opens into the space of the centre of the scale, and discharges the quantity just weighed in the opposite side. Thus the cylinder oscillates, weighs, and discharges simultaneously any fixed quantity. The dial plate, P, in connection with two hands connected to two metallic toothed discs acted upon by simple ratchets, indicates the number of discharges, which, by multiplication with the number of pounds on the beam, gives the exact amount which passes through the scale.

This scale requires no attendant, being self-acting by the weight of the grain; and as the dial, and, in fact, the whole machine, may be enclosed and put under lock and key, the quantity delivered may at any time be known. The dial may, by a simple modification, be made to register a million discharges.

These scales are now in use, from the portable one bushel machine, which weighs 5,000 bushels a day, to that of twenty bushels' capacity, discharging 9,000 bushels per hour.

THE SCIENCE OF THE ENGINEER.*

BY W. J. MACQUORN RANKINE, C.E., F.R.SS. L. & E., &c., REGIUS PROFESSOR.

The engineer is he who, by art and science, makes the mechanical properties of matter serve the ends of man. In the widest sense, almost every man is more or less an engineer. The first man who bridged a torrent with a fallen tree, had in him something of the engineer; the first man who dug a new channel for a brook—the first man who cleared a pathway in the forest, had in him something of the engineer; but the title of engineer is more properly restricted to those who make the useful application of mechanical science their peculiar study and profession.

In the history of mechanical art, two modes of progress may be distinguished, the *empirical* and the *scientific*. I do not say the *practical* and the *theoretic*, for that distinction is fallacious. All real progress in mechanical art, whether theoretical or not, must be practical. The true distinction is this, that the empirical mode of progress is purely and simply practical; the scientific mode of progress is at once practical and theoretic.

Empirical progress is that which has been going on slowly and continually from the earliest times to the present day, by means of gradual amelioration in materials and workmanship, of small successive augmentations of the size of structures and power of machines, and of the exercise of individual ingenuity in matters of detail. This mode of progress, though essential to the perfecting of mechanical art in its details, is confined to making small alterations on existing examples, and is consequently limited in the range of its effects.

Scientific progress in the mechanical arts takes place not continuously, but at intervals, often distant, and by great efforts. When the results of experience and obser-

* From an Introductory Lecture delivered to the Class of Civil Engineering and Mechanics, in the University of Glasgow, on the 4th of November, 1856.

vation on the properties of the materials which are used in a class of structures, and of the laws of the actions which take place in a class of machines, have been reduced to a science, then the improvement of such structures and machines is no longer confined to amendments or enlargements in detail of previously existing examples; but from the principles of science practical rules are deduced, showing not only how to bring the structure or machine to the condition of greatest efficiency consistent with the available materials and workmanship, but also how to adapt it to any combination of circumstances, how different soever from those which have previously occurred. When a great advance has thus been made by scientific progress, empirical progress again comes into play, to perfect the results in their details.

But the best mode of explaining the distinction and the proper functions of empirical and scientific progress in mechanical art is by a passage in its history, and I select for that purpose the progress of the steam engine. The Egyptians used steam in an imperfect way to move small pieces of mechanism from an unknown period of antiquity, as we know by the writings of Hero, who lived more than a century before the Christian era. For seventeen centuries after Hero's time we have no record of any progress in the use of the motive power of steam; but with the revival of learning came the introduction of Hero's writings into western Europe, and then began the modern empirical progress of the steam engine, which lasted for about a century and a half, and consisted in improvements by slow degrees in matters of detail. At the commencement of the seventeenth century De Caus applied the direct pressure of steam to raise a jet of the water itself from which the steam was produced. Forty or fifty years afterwards Lord Worcester added a separate boiler. After thirty years more, Papin invented the cylinder and piston; then Savery introduced the use of the condensation of the steam by a stream of water. Early in the eighteenth century Newcomen combined the inventions of his predecessors into the atmospheric engine; in which, for about half a century, improvements in detail continued to be made by Potter, Beighton, and others, until, in the hands of Smeaton, it became, considering the general condition of practical mechanics at the time, a very perfect machine in workmanship and mechanism. But all this improvement had been merely *empirical;* and in everything that depended on principle, the steam engine of that period was a most rude, wasteful, and inefficient machine. Then came the time when science was to effect more in a few years than mere empirical progress had done in nineteen centuries. Watt set to work scientifically from the first. He studied the laws of the pressure of elastic fluids, and of the evaporating action of heat, so far as they were known in his time (and you well know that near this spot he pursued his studies); he ascertained as accurately as he could with the means of experimenting at his disposal, the expenditure of fuel in evaporating a given quantity of water, and the relations between the temperature, pressure, and volume of the steam. Then reasoning from the data which he had thus obtained, he framed a body of principles expressing the conditions of the efficient and economic working of the steam engine; and the first engine that was made according to those principles completely succeeded, and fulfilled Watt's anticipations exactly. The specification of Watt's first patent contains no minute details of mechanism; it consists almost entirely of broad, general principles; and down to the present day the practical improvements in the steam engine have consisted chiefly in the carrying out and development of the principles of Watt, and in the gradual perfecting, by *empirical progress,* of the workmanship and mechanism.

Watt's success was owing to this—that before proceeding to put his invention in practice, he had well studied its theory.

It is true that the empirical practice of all arts is more ancient than the theory; and this indeed is necessary, because practice furnishes part of the data on which theory is founded, and propounds questions for theory to solve.

But periods from time to time arise (such as that of the discoveries of Watt) when it becomes necessary for theory to take the lead of practice, and to lay down the principles by which future practice must be guided; principles founded, not only on the facts of former practice of the arts in question, but on the study and comparison of all the natural phenomena which are connected with that art.

And herein lies the most important advantage of the application of science to practice. Those who study practice empirically alone, have for their guidance only the structures and machines of former engineers, with the waste of material, and loss of power, and other faults involved in them; and, with all the patience and ingenuity which can be applied to those data, considerable improvements can only be attained at the cost of repeated failures, and errors in principle may remain for ever undetected; but he who studies the sciences that bear upon his art, has before him, in

natural objects, and in the order of the universe, structures in which there is no waste of material, and machines in which there is no loss of power. Thence he learns to see in each work of human art how far it falls short of perfect efficiency; and, although perfect efficiency be unattainable, he learns to judge in what direction practice ought to strive, in order to approximate to perfect efficiency as nearly as is possible to human skill.

In the sequel of this course I shall have frequent occasion to show how the theory of a structure or machine sets before the mind of the engineer an *ideal* perfectly efficient model, not capable of being fully realized, but serving as a guide to the efforts of practical improvement.

(*To be continued.*)

OUR GUNBOAT AND MORTAR-BOAT FLOTILLA.

As the relations of Great Britain with foreign powers have been neither very close nor very cordial since the recent war, much of the belligerent spirit evoked by it has doubtless continued to the present—sufficient, at least, to assure us that many will learn with interest what has been done, and is being done, with that vast and costly flotilla of light war craft, the mere menace of which did much towards bringing us a speedy peace.

This flotilla—every vessel of which is of a very light draught of water, and therefore suitable to be applied to numerous services to which the whole of our navy, before the war, was inapplicable—may be said to consist of five classes of vessels, namely, despatch, or, more properly, gun-vessels, gun-boats, mortar-vessels, mortar-floats, and floating batteries, of which all but the mortar-vessels and mortar-floats are propelled by steam. The gun-vessels, gun-boats, and mortar-vessels are of wood; the mortar-floats of iron; the floating batteries, some of wood and some of iron, and, in all cases, cased with iron plates of 4½ ins. thickness. It is evident that craft like the gun-vessels and gun-boats—light, swift, commodious, well-armed, easily handled, independent of wind and tide, and capable of acting separately or in concert—will always be useful in the British Navy, which has at times to attack or menace on the shores of almost every sea, either in waging war, or enforcing treaties, or protecting the Queen's subjects, or capturing slave traders, or exploring barbarous countries. A considerable number of these vessels is accordingly at present employed in the Black Sea, the West Indies, China, and elsewhere; and in all probability there will always be many of them in commission and on active service. The great bulk of them, however, and the whole of the mortar-vessels and floats will have to be otherwise dealt with.

A wooden vessel, built in haste, of green timber, put together roughly, and carelessly caulked, is liable, if unattended to, to be speedily devoured by dry rot. And this is precisely the case with these vessels, which were built with comparatively little regard to anything but the time named for their completion. However honourable their builders, and however faithful the dockyard officers who inspected their construction, may have been, the rapidity with which great numbers of them were prepared was such, that unseasoned timber and careless workmanship must necessarily have been resorted to. The examination of many of them in dock has, indeed, shown this opinion to be true. These circumstances being understood by the Admiralty, it became highly desirable that means should be provided for removing these vessels from the water, in order that planks might be taken out here and there, and other contrivances adopted for the double purpose of seasoning their timbers, &c., and of affording opportunities for the necessary inspection and repairs. It was also felt to be advisable that the iron vessels should likewise be removed from the water, as they could be preserved from wear and rust much better out of it than in it.

Now to effect these objects by the use of the ordinary dry docks of our dockyards, was altogether out of the question, because they would not contain a tithe of the small craft we now have in our Navy, and are all incessantly required for the construction and repairs of the larger vessels. Hence arose a difficulty to which many turned their attention, and, among others, Mr. Thomas White, shipbuilder, of Portsmouth, who for years has both used, and constructed for the use of others, a patent arrangement of hauling-up slip, by means of which vessels, either large or small, may be drawn out of the water with great facility, for fitment, repair, or stowage. It occurred to Mr. White that, under the circumstances of the case, it would be very convenient to stow the gun and mortar vessels in parallel

tiers, side by side, and to place any number of them thus, by means of one principal slip-way, up which the whole might be successively drawn, and from which they might be removed on lateral rails to front their respective stalls, into which they could then be taken. This plan was submitted to the Admiralty, who approved of it, and committed the execution of it to Mr. W. Scamp, Deputy Director of Engineering and Architectural Works, Somerset House. This gentleman interested himself warmly in the undertaking, facilitated it by many suggestions and improvements, and, in conjunction with Mr. White, has carried the system out very successfully.

A tract of land at Haslar, near Gosport, bordering on Haslar Creek, was selected to receive 200 vessels, and the necessary arrangements were proceeded with. The plate at the commencement of this Number represents the details adopted. The first vessel (the *Gnat*) was hauled up on the 25th of November last, and has been followed by numerous others. In raising a vessel, she is first drawn upon a slip composed of two parts, of which the under part is a carriage running on wheels along rails laid on the principal slip-way, and the upper a carriage furnished with wheels to run on rails laid on the under carriage. This under carriage is tapered, or diminished in depth at its fore end, so that the upper surface of it may lie parallel to the surface of the lateral ways, and of the sheds or stalls. When the vessel is grounded upon the slip, and supported by wedges or blocks, placed under it by means which it is unnecessary to describe here, the slip is drawn up the ways by tackles, &c., worked by a fixed steam engine of sixteen horse power. On its arriving at the upper end of the principal or trunk slip-way, the hauling ropes are connected to the upper carriage, on which the vessel immediately rests, and this carriage is then drawn forward along the rails on the lower carriage, and is received upon rails laid on a lateral transporting table—the ends of the rails on the lower carriage and on the transporting table corresponding with each other. The traversing table, with the vessel upon it, is then drawn away laterally by a small locomotive steam engine, until it is brought in front of the stall appropriated to it. The upper carriage is then again drawn forward off the transporting table, by tackle from the fixed engine, and bears the vessel to its position in the stall. The vessel is now blocked up, and freed from the carriage, which is then run back on to the traversing table, and borne by it to the lower carriage of the slip, on which it is received, and with which it is lowered to receive another vessel. It will be evident that by employing an increased number of transporting carriages and tables, the time expended in raising a number of vessels may be much reduced.

The improved system of hauling up and stowing vessels will, without doubt, come into very general use, both at home and abroad. It has, in many instances, great advantages over the practice of dry-docking, particularly in the case of paddle-wheel steamers, the paddle-boxes of which are great impediments to the docking of such vessels. Besides this, merchant ships are now built of such a length that it is becoming impossible to place them two or three on end upon a slip for repairs, as was formerly done. In the event of war, our hundreds of small war craft could not possibly be accommodated in the existing docks, the demand for which, for the reception of large ships, is continually increasing. In many foreign ports, particularly in harbours where there is but little or no tidal change, the arrangement will become indispensable. Mr. White will, therefore, we hope, receive ere long a suitable reward for his labours in extending the employment of hauling up slips.

Ultimately, when the gun and mortar-vessels are sufficiently seasoned and again completed, it would be desirable, we think, to fully fit them for sea, making them their own storehouses, so as to be ready for active service at the shortest possible notice—an arrangement which would certainly be attended with many advantages.

With the floating-batteries but little more can, we apprehend, be done than to have the best possible attention given them afloat. One of them might, however, be made a target of, as was recently designed, with great advantage; for, as the *Times* remarks, that is the only efficient method we have of testing their fitness for the service for which they are intended.

ON THE FORM OF SHIPS.

A pamphlet, under the title of "Experiments on the Form of Ships and Boats," has made its appearance in one of the unpretending series published by Weale; and, among various doctrines promulgated, it offers some already recognised, and some that will be new to the reader. The work affords another instance, it is believed, of the *apparent* anomaly, that discoveries and inventions in sciences and arts are often made by persons quite unconnected with the vocation which would be expected first to elicit them. The author certainly deserves credit for his ingenious, consecutive, and methodical course of 70 experiments

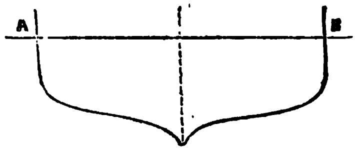
which he has clearly, though concisely, described, and which must have been gone through with much labour and some expense. An objection may be raised to the rather Lilliputian scale on which those experiments were made, but stronger denial would probably attach to the circumstance of their being all performed in still water.

Mr. Bland, the author, comes to one decision, which will be supported by many of the best constructors, though it is often lost sight of, namely, that it is impossible to combine in any single model *all* the qualities which are desirable in a vessel. To expect this is as reasonable as to expect the same horse to excel equally on the race-course, in the dray, and on the road; in fact it becomes a question if, to a certain extent, the possession of one quality (as capacity) in a high degree does not absolutely involve the sacrifice of another (as speed), and *vice versâ*. The experiments, at all events, show that an approximation to the much talked of form of "least resistance" had also the least stability, and therefore least power of carrying sail, so that it would lose in the last respect more than it would gain in the first. It is nevertheless contended by the pamphlet that certain forms do largely possess several excellencies conjointly.

Among the novelties (if anything *can* be novel) which Mr. Bland brings forward is the dictum, supported by experiment, that the hollow "wave line" is not very favourable to speed; on the contrary, that it is rather inferior to the straight-lined bow of equal length and breadth, and slightly still more inferior to a bow with gently convex lines. Also that so prejudical is the straight line in the "half breadth" plan of a vessel that a model with convex lines, although nearly one-fourth larger than a model with straight sides, proved, notwithstanding, equally fast under the same motive power. Thirdly, that while a moderate depth of keel is beneficial, a very great depth is injurious, and tends to overset!

An elongated bow always showed its superiority in speed over a bluff one, and it was found that the point of extreme breadth ought to be before the mid length of ship, as in the analogous cases of birds and water fowl. For sailing vessels great breadth of beam is advocated, because of the high ratio of stability, or power of carrying sail, which it confers, and for the same reason the depth is limited to a smaller proportion of the beam than is at present usual. The draught in amidships is fixed at such a measurement, as under a bracketed form of bottom, thus fig. 1. (AB being the low-water line),

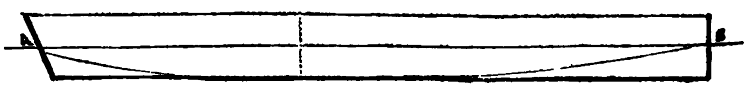
Fig. 1.



would amount to only two-fifths of the beam; or, if the immersed part were perfectly rectangular, only one-fifth of the beam. The reader perceives that in the latter case the draught of present three deckers would be reduced from 25 feet to about 12! Upright sides, and in amidships a "kettle bottom" are considered to be the best; and the latter is altered, as above, merely for the sake of making up a certain draught without increasing the displacement.

It is curious to notice that Mr. Bland adopts principles from each of those late bitter opponents, Sir Wm. Symonds and the School of Naval Architecture: with the former he takes very great breadth of beam and overhanging stem, and with the latter wall sides and bracketed bottom. His rule that the centre of gravity should not be above the load water line, it would probably be impossible to carry out in large men-of-war and many merchantmen; and as before hinted, great exception must be taken to his trials being solely in smooth water. The most scientific naval architects are quite agreed that the mere form must not only be considered, but also the various changes of relation which the outline of hull and the waves must bear to each other under their many and complex motions. For instance, Mr. Bland, while he retained the straight keel, found velocity much improved by cutting up the bottoms of his models longitudinally from the deepest section in an inverted arch to the stem and stern, in this form (A B being again the load water line).

Fig. 2.



But, whatever advantage may be gained thereby would be more than counterbalanced by the pitching and 'scending when the vessel laboured in a heavy sea—in that state, the bow would at one time shoot above the water, and at another be

suddenly buried in the midst of a rising wave; and the shocks would not only greatly retard the speed, but would make the vessel a most uneasy sea-boat, severely strain the hull, and endanger the safety of the masts. Mr. Bland observed that an overhanging bow in still water "threw the water off admirably, or rather it may be said to ride over it;" and the fact needs no proof whatever, but it is well known that Sir W. Symonds' vessels which have over raking bows, and sides somewhat bulging out above the water line, though they have (on account of those characteristics) great speed and stability in fair weather, are, for the same reasons, much inferior in both respects, and very uneasy, in foul weather. Besides which, it must be recollected that the fastest sailing frigate in the world, the *Phaeton*, 50, and the fastest brig, the *Daring*, 12, both built by Mr. White, of Cowes, have bows which, whether viewed from the broadside or from before the cut-water, present a very upright and even outline.

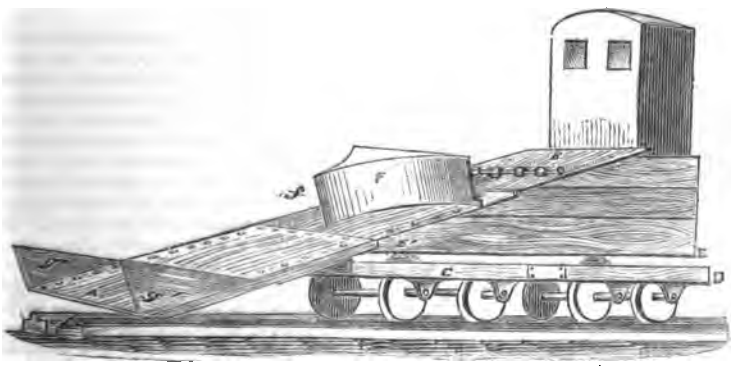
Mr. Bland deserves the thanks of his country for what he has already done, and he would be deserving of more were he to carry his researches further. It might be suggested to try his models across a strongly rippling stream, to repeat that experiment with the models heeled over by weights to an angle of five or ten degrees, and to try their speed and easiness by the traction of lines not fastened to the stem, but to the summit of a miniature mast or masts as high as one half or one third of the vessel's length, &c. It is more than likely that many of the experiments repeated under such change of circumstances would yield quite different results from those already arrived at, and would tend still further to elucidate the high art and *mystery* of ship-building.

H. Y. P.

IMPROVED RAILWAY SNOW PLOUGH.

Snow ploughs heretofore used for removing snow from railroad tracks have been designed and constructed with a view to press the snow directly from the tracks in a lateral direction, and for this purpose they have been generally provided with two vertical curved shares or surfaces, commencing at or very near to the point of the snow plough, and immediately diverging laterally. In the use of such ploughs it has been found that in deep snows the snow becomes wedged or packed together at the sides of the track, making it very difficult for the plough and the cars to force their way through; by such ploughs, moreover, the snow is only temporarily pressed away at the sides, and after the plough has passed, a considerable portion falls back on to the track again.

A patent has, however, recently been obtained in this country (as a communication to Mr. Newton) for an invention which consists in so constructing the snow plough, that a simple inclined plane or wedge acts in the first instance to raise up the snow entirely, and then two vertical surfaces, curving laterally, press off the snow so elevated on to the top of the surrounding snow.



The accompanying engraving is a perspective view of the improved implement. It occupies a position in front of the locomotive. C, and D, are two ordinary four-wheel trucks, which are attached by bolsters to a lower frame or support E, E′, in such a manner as to allow the trucks to pass freely around curves, in the manner in which locomotive and carriage trucks are now made to swivel. A, B, is an inclined plane, made of metal or wood, and attached permanently to the lower piece E, E′. The portion A is made to project in front of the truck C; the plane A, B, rises from the

point A gradually, say, at angle of about twenty degrees to thirty degrees; (where the snows are light, this plane might rise more rapidly.) This plane A, B, is of uniform level transversely as far as the vertical piece F; this piece F is so constructed as to present two vertical surfaces, meeting at the point *f*, and curving laterally outwards, and rising from one to three feet, proportioned to the usual depth of the snow in the section of country where this snow clearer is used. The entire piece F is made to slide up and down along the plane A, B, by means of a plate, with a flange or rim fitting over the edges of A, B, or by means of projections on the under side of F fitting into slots in the upper surface of A, B, in order to adjust it to any required position. The proper position for the efficient action of this wedge-shaped piece F is when the point *f* is placed just at the height of the upper surface of the surrounding snow. The front vertical surfaces of the wedge have a double curvature, curving slightly inwards as they rise up, so as the more easily to deliver the snow raised from the track on to the surface of the surrounding snow. When the piece F has been adjusted in the proper position for the depth of the snow, it can be secured there by means of pins or bolts, as shown in the drawing.

"The interior of the space between E, E′, and B can be occupied," says the patentee, "with advantage by a series of circulating hot water or steam pipes, or by a boiler or furnace, for keeping the surface of the plane A, B, warm, and diminishing the adhesion of the snow to the surface of A, B."

When there is a crust of ice on top of the snow, two thin or sharp vertical metallic plates *g* and *g′* may be attached to the sides of the plough in front, for the purpose of cutting through the ice or crust on top of the snow. The tops of the plates or cutters *g* and *g′* are to be just high enough to reach the surface of the snow, and cut through any crust of ice formed there.

CAPTAIN SCOTT'S IMPROVED CEMENT.

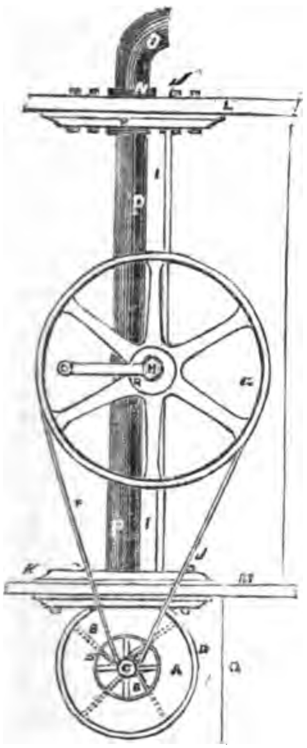
Captain H. Young Darracott Scott, of the Royal Engineers, has patented a method of preparing, from common quick lime, a substance which will, when ground to powder and made up with water, set somewhat after the manner of Portland cement, and gradually attain a very great degree of hardness, thus differing essentially in its action from the preparation of lime as ordinarily used. He takes quick lime, prepared by any of the ordinary methods, and introduces it between two perforated and perpendicular brick walls contained in a kiln, which is also furnished with a fire-place, to allow of the lime being raised to the required temperature. The roof of the kiln is arched, to reverberate the heat through the lime, and the distance between the perforated walls containing it may vary from one to two feet and upwards, according to the size of the kiln. When the lime is raised to a dull or cherry red heat, the firing is raked out, and iron pots containing ignited sulphur are then introduced into the kiln, care being taken that they are so placed as to be protected from such a heat as would cause very rapid ebullition of the sulphur, and that no further access of air is allowed than that which is found when the flue is shut and the ash-pit and fire-door closed.

The process may be carried on in kilns of various forms, and, in fact, a more equable distribution of the sulphurous acid is obtained when the lime is placed on perforated horizontal floors, the above-described form being used only on account of the greater facility which it offers for charging and discharging. The effect can also be produced on the lime while still in the kiln in which it has been burned; but this method of procedure has been found precarious, apparently from the difficulty of adjusting the temperature, and of producing regularity of action by the sulphurous acid throughout the mass. The lime may be used in lumps of the size of a cocoa-nut, and, in a well-constructed dry kiln, one pound of sulphur is a fair allowance for each bushel of lime operated on. The larger the kiln the more the process should be prolonged.

CAPTAIN HUBERT'S APPARATUS FOR VENTILATING SHIPS.

The accompanying engraving represents an apparatus, lately patented by Captain Hubert, of the French Navy, for ventilating ships and vessels. A is the ventilating fan, composed of four or more arms or wings, B, fixed to the axis, C, which is placed in the centre of a cylindrical box or case, D. This axis is made to rotate with considerable rapidity by means of a small pulley, E, fixed at the extremity of the axis, C. Upon this pulley a strap or band, F, passes, and thence over a large fly wheel, G, the axis, H, of which is secured to the upright frame or support, I, attached by means of bolts and nuts, J, to framework, K, of the poop, L, and lower deck, M; N is a short brass tube fixed to the poop deck, L, and frame, K, which tube may be closed by any suitable means. To the top of this tube the bent pipe, O, is screwed, and at the bottom the vertical pipe, P, is fixed. This pipe passes through the deck, M, and frame, K, and is attached to the upper part of the

cylindrical case of the ventilating fan, A. This fan is placed in the hold, Q, of the vessel, and by turning the handle, R, keyed or otherwise fixed to the axis, H, of the fly wheel, a rapid rotatory motion is given to



the arms or wings of the fan, which causes the impure air in the vessel to enter through the opening, S, on each side of the cylindrical case, D, when it becomes forcibly expelled up the pipe, P, and passes out to the external air through the bent pipe, O. In this manner the foul air of the vessel is removed, and a thorough ventilation obtained. The apparatus can be put in motion by steam, wind, or other motive power.

THE CRYSTAL—THE PEOPLE'S PALACE, SYDENHAM.—NO. III.

THE People's Palace should be neither a mere botanical nor a zoological garden, a museum nor a gallery, a college nor a school, a lecture nor a preaching-room, a place for industrial or art-exhibitions nor a shop, an arena for gymnastic or other games nor a lounging-place for those wishing to *enjoy* leisure (*otium cum dignitate*); the Crystal Palace ought to *combine* all these: it should recruit the visitors from all ranks of society, however *minded* or disposed, and afford attraction which no other place of public resort can do to the same extent. It might be so conducted, that if the Crystal Palace should ever fail, its failure would not imply the failing of the Company, but the bankruptcy of the English people, as an intelligent, progressing, and sovereign body. A people which is not permitted to *recreate* itself, has to repeat (under another set of circumstances) the process of "the decline and fall of the Roman empire."

I think it was not intended at first to have daily musical performances at the Palace; without these, however, it could *not* exist, without being reduced to a mere gallery and park. Who at Rome even would make, without music, the Villa Pamphili or any other, a place of common daily resort, *if* even no fee of admission were to be charged? I think that the usual daily musical performances will be a most accurate thermometer of the general position of the Crystal Palace affairs; for surely the resonance of music in the huge vault of the transept, and its gradual and fainter spreading over the whole building, with its thousand of art-works and its splendid vegetation, is an enjoyment which no monarch of the world could ever boast of. Besides, it is music, in which we moderns excel to such a degree, that the tunes of Beethoven (whose political and social ideas are known) transport us to a period which is yet to come. But here, to begin with, my definition and theory of the people's palace are to be applied at once. The Crystal Palace is a place of re-creation for the people, not merely one for the study of music or anything else. This at once determines the sphere of musical selection for the daily performances in the transept. They ought to comprise (and begin with) the highest samples of composition. We have further to consider that there is a part of our community (the Society of Friends), who object to every kind of music save the sacred oratorio. Thus, every part of the concert ought to begin with a *morceau* of that kind from Handel, Bach, Haydn, &c., which would be also most acceptable to every serious-minded person. But as—to repeat—the people's palace is a re-creation place for all, old and young, the valses of Strauss, Lanner, some of the quadrilles of Musard, &c., ought also to be daily performed. Between these two extremes, some operatic music, &c., might be duly intercalated. I especially caution the Company not to make the palace the show-room, as it were, for the polka or quadrille freaks of their leaders, lest such stuff should then spread all over the country with the guarantee of the Crystal Palace—a procedure which, in another instance, has

flooded the country, to the detriment and exclusion of other sterling and serious music.

I think, in general, that *none* of our Societies (that in Somerset House included) will ever be well managed, until their committees will sit with *open doors* to all members (in the main, the old Anglo-Saxon custom.) Thus, I think, that the formation of open committees—musical, artistic, botanical, gardening, financial, &c., would be productive of much good. Shareholders in the *people's* palace ought to consider themselves morally bound towards the people; besides, every open committee door leads now to St. Stephen's! I should not believe that the musical committee ought to interfere with the usual daily arrangements of the leaders; but that its functions should chiefly consist in examining and deciding on such musical compositions as young English composers should send in for execution and public competition. And in this instance, first, the Crystal Palace would become doubly endeared to, and deserving of the nation. It is not the place here to enter into the detail of musical and other prize competitions and awards; but I must say that, as I suggest that the *charges* of the Crystal Palace be everywhere *fair* and equitable, it strikes me, that the company ought not to defray the amount of prizes to be awarded, but that this be done by private subscriptions beyond the pale of the company—an easy matter in a country and age where acts of public benefaction are so numerous.* As the Crystal Palace and grounds is the only place in England (or the world), which can accommodate, say 50,000 or 100,000 people simultaneously, it is a matter of plain necessity, that every really *national* pageant and festivity should be there celebrated. Speaking financially, I assert, that every great talent, which would pass through the Crystal Palace to the world, may be valued at 100,000 admission fees paid to the company. J. Lotsky.

15, Gower-street, London.

(*To be continued.*)

A NEW RAILWAY SYSTEM.

A railway is proposed to be constructed near Lyons, on steep gradients, with a view to avoid deep cuttings, and embankments, or tunnels, and to test a new system of carriage invented by M. Bourget, a civil engineer, for working it. A break placed under the carriage holds on to a third rail, when the train stops, but when in motion the part which seizes on the rail opens by the effect of the onward movement, and closes with great force the moment the train ceases to go forward. It is stated that a number of trials of the plan were made by the Council of the Ponts et Chaussées, and that they sanctioned the employment of the system. The Lyons journals state that the shares issued for raising the necessary capital to execute the line were subscribed in three days.

* There was found, some years ago, an envelope in the street-box for contributions to the Free Hospital, London. It contained merely the words, "By a Passer-by," and a £500 bank note!

CORT'S INVENTIONS.

The *Legal Observer* has the following remarks upon the inventions of the late Henry Cort: "It was recently stated by Mr. Stephenson, M.P., the President of the Institution of Civil Engineers, in his opening address, that no less than fourteen millions sterling had been paid to the parliamentary, legal, and engineering professions for their charges alone in obtaining 45 acts of Parliament for establishing railways, besides the subsequent annual costs of solicitors and engineers in the progress of these vast undertakings. We are unable to apportion the amount respectively received by the solicitors, the parliamentary agents, and the engineers, but cannot be far wrong in supposing that five millions at least have been paid to the legal practitioners. We have heard of one bill of costs of 250,000*l.* on a railway of seventy miles; but this included enormous fees to counsel, the expense of innumerable purchases, investigations of titles, many special contracts, and the parties dealt with as occupiers, leaseholders, or freeholders being many thousands.*

"We have been induced to notice the magnitude of these railway costs on account of an appeal made to the nation, as well as to Parliament, in support of the claim of the descendants of *Henry Cort* to compensation for his invaluable inventions in the manufacture of iron—a claim which has been most powerfully supported by many of the public journals. We have an additional motive in submitting the case to *our* readers, inasmuch as one of the sons of Henry Cort was a highly respectable and intelligent solicitor,† who practised many years in Gray's-Inn and the Temple."

After quoting from the *Times* upon the subject, the *Legal Observer* adds, "The counsel and solicitors who have so largely participated in the benefits resulting from these ingenious discoveries may fairly be expected to take into consideration the claim now submitted to the public."

* It may be supposed that this vast sum of five millions has made up to the profession the loss sustained by the numerous law reforms, but these millions have been divided amongst a small number of the general body.

† Amongst other testimonials laid before the Government, in the son's lifetime, was one from Sir Anthony Hart, the Irish Lord Chancellor.

TONNAGE REGISTRATION.

To the Editor of the Mechanics' Magazine.

[We publish the following letter with some reluctance. There are several considerations, however, which induce us to give it insertion, and we are also aware that its suppression would be less fair than its publication.]

Sir,—I am too much occupied with my own business to engage in anything which does not directly interfere with my interests, and have, therefore, paid little attention to the agitation which I consider was vainly being levelled against the present registration law of the tonnage of ships. I have continually heard the name of Mr. Atherton as prominently distinguished in that pursuit, and have been compelled more than once to hear, with a sore trial of my patience, the confused ideas of a Mr. Henderson in furtherance of the same purpose. But as I could see neither public good nor private advantage to be derived from their proceedings, I was unwilling to give them even a passing thought to the detriment of my more profitable engagements.

I am, however, now informed that these two gentlemen have succeeded in inducing the British Association for the Advancement of Science to appoint a committee, the members of which these parties have, I understand, themselves nominated, to inquire into the merits of their schemes, with the ulterior object of abolishing the existing law And as that learned body appears to be now moving in the matter, and the agitation assuming thereby a more substantial aspect, shipbuilders and shipowners can no longer view such proceedings with indifference.

This being the altered phase of the agitation, I have been roused to inquire into the means by which it has assumed this more practical character; and I find that a lecture given by Mr. Atherton, on the 16th January last, at a meeting of the Society of Arts, and a Report by Mr. Henderson, read to the British Association in August last, have been the only grounds on which that Association have been induced to lend their name and authority in support of the object of these gentlemen. Having been recommended to read Mr. Atherton's lecture, which is said to have mainly contributed to this result, I have accordingly done so. I have also read your able disquisition on its merits in the *Mech. Mag.* of the 12th of April last. And I need scarcely tell you that your criticisms, at once sound, logical, concise, and of most gentlemanly bearing, contrast strongly with the vapid, sophistical, pompously verbose, and reckless mis-statements of that strange production.

Your fundamental knowledge of the subject, brought so honestly and eloquently to bear on every point of that empty declamation, has so unveiled its pretensions, that I am surprised at the courage of the author daring further to deal with a subject, to the difficulties of which you have proved him so utterly incompetent. You shall, however, speak for yourself on this point. You first clearly prove that, by the present system of tonnage registration of the Merchant Shipping Act, the "Government has succeeded very well in the only object it had in view, viz., to lay a fair tax upon vessels, leaving the shipowners and shipbuilders at liberty to adopt such type of build as they might think best, without thereby incurring loss;" and you then conclude your review of that extraordinary document in the following terms:

"Upon the whole, then, we consider that Mr. Atherton's case against the New Law of Tonnage has signally failed. He looks to it to perform an office which it was never intended to perform, and which it could not conveniently be made to perform, namely, to act as a guarantee for the safety of vessels against shipwreck. He seeks to substitute for an easily applied correct approximation, a very clumsy empirical formula, which is but a small improvement on the old builder's measurement. He founds his whole system on the old rock on which so many former attempts to measure tonnage have split, namely, the accurate determination of the load water-line; and after all this accuracy in one element, he makes his final result valueless by excessive inaccuracy in other elements; to use his own metaphor, he strains at a gnat in endeavouring to fix the deep draught, on which builders cannot be made to agree, and swallows a camel in multiplying his results by an empirical factor, leaving the particular factor to be employed so uncertain as to depend upon some officer or another's judgment of the greater or less degree of the fineness of the lines of the ship; and, to conclude all, feeling, no doubt, the weakness of his case, he calls the authorized rule hard names to raise an unfair prejudice against it.

"For scientific purposes, doubtless a knowledge of the real displacement of vessels, and of the horse-power employed at certain rates of steaming, would be very valuable. To obtain this knowledge, however, by Act of Parliament, we believe, at present at all events, impracticable—more injurious than beneficial to the interests of naval architecture—sanctioning a principle of direct interference on the part of Government in private enterprise, which must tend to injure the free character of that enterprise, on which it depends for its healthy and vigorous existence—and introducing into this country vexatious and inquisitorial proceedings which are most unsuited to its genius, and which we most heartily pray may never be sanctioned.

"Nor do we think that the Government are fairly chargeable with the blame of having left the security of life unprovided for in the Merchant Shipping Act of 1854. Persons having a direct personal interest in shipping have, on the contrary, loudly complained of the great hardships and severe mulcts to which many of its provisions subject them in cases of loss and injury in which no blame is imputable to the owner. For our part, we think a perusal of those parts of the Act which bear on shipwrecks and loss of life will show that Government has involved the owner in such responsibilities in case of accidents, that it is his

most direct interest to provide most anxiously and carefully against their occurrence. Mr. Atherton has made himself merry with several of the penalties which he considers quite inadequate. And he comments in terms of no small severity on the ninth part of the Act, which contains clauses for the *limitation* of the shipowner's liability—a thing, he says, before unheard of.

"Now, on referring to these clauses, we find that such limitation of liability refers *solely to those cases in which the loss or damage to be made good shall happen without the actual fault or privity of the owner.* But in cases where the loss or damage can be fairly laid to the door of the owner, then is there no such limitation of liability, but the assessment of the damages is left to a jury.

"If, however, these provisions are still insufficient (the shipping interests exclaim against their hardship and injustice), then add to them whatever may serve to insure a due amount of caution and care on the part of the owner. Let us not, however, be so illogical as to charge to the very innocent clauses for tonnage registration—enacted with the sole view of levying tolls fairly—the tremendous consequences of culpable negligence with respect to human life which would be chargeable (if at all) on quite a different set of provisions in the Act.

"Lastly, one word as to the value of the scientific objects Mr. Atherton wishes to secure. No one can appreciate these more highly than we do. We believe that much good would result from the free interchange amongst shipbuilders of the data upon which they must be founded. But then this interchange, to do any good, must be voluntary not enforced; and we must trust to the diffusion of scientific knowledge amongst this class, and to a love—let us hope a growing love—for science itself among them, for the attainment of this most desirable end. One of the worst ways to secure the good will of the shipping interests to science, and to enlist their sympathies on her side, is to make an onslaught, tooth and nail, with or without reason, on what they hold, and justly hold, in respect, and involve them all in one general charge of doggedly pursuing their own ill-gotten gains against the general good of society at large. As real and sincere lovers of science, and, we believe, in her best interests, we beg most emphatically to separate her cause from the too-zealous advocacy of Mr. Atherton."

Now, Sir, after such an exposition of his futile schemes, as cited in the above extract, can any one for a moment suppose the author of this lecture could possibly hail you as an adjutor in his projects? Such, however, is the fact; for, in the *Mechanics' Magazine* of the 27th September last, after justly acknowledging you as the literary exponent of an influential section of the public, he says, "It is, I beg to assure you, with the greatest satisfaction that I forego any petty" (weighty, he ought, in honesty, to have said) "points of difference of opinion that may exist between us as to any suggestions which I have made with a view to remedying the deficiencies of our present system of tonnage registration. I am proud to regard myself as acting in co-operation with the editor of the *Mechanics' Magazine*, as the organ of the section of the public before adverted to, claiming the revision of the Merchant Shipping Act, 1854, as respects the admeasurement for tonnage and registration of shipping, on grounds so forcibly expressed in the editorial articles of the *Mechanics' Magazine.*" He then enumerates various points in reference to the science of naval architecture which you have admitted as most worthy the attention of shipbuilders, but any legislative interference with which you have, as already cited, most emphatically deprecated. How then, in honest argument, can this gentleman hail you as co-operating with him in claiming the revision of the Merchant Shipping Act, 1854? I ask you, Sir, can there be honesty of purpose in so mis-stating and tortuously twisting your opinions?

Can it, moreover, be believed that this delusive argument of your co-operation in claiming legislative enactment on these scientific points was urged on the British Association as the good and sufficient cause for the committee which has since been appointed on the question? Such, however, is the fact; for Mr. Henderson, in his Report of August, 1856, to the Association, after stating that the editor of the *Mechanics' Magazine* had proposed corrections of our present system of registration for scientific purposes, adds, "Such being the declaration of opinions expressed by the editor of the *Mechanics' Magazine*, one of our most popular periodicals devoted to science, in respect of the deficiencies of our present system of statistical registration of tonnage, it is respectfully submitted that good and sufficient cause is shown for the re-appointment and further continued labours of the committee on this subject."

Contrast these words of Mr. Henderson with your opinions, already herein quoted, and you cannot be surprised when I repeat that I look in vain for honesty of purpose in these proceedings. Is science, truthful science, the object to be promoted by such doings? No, Sir, the object from the beginning has been, manifestly, a premeditated onslaught on Part II. of that admirable Act, the Merchant Shipping Act of 1854, why or wherefore is best known to the parties themselves.

It may be summarily gathered from the whole of your editorial articles connected with this subject, that you are satisfied the present system of tonnage well fulfils the purposes for which it was established; and in regard to Mr. Atherton's views, you go no further than to say that the knowledge of the weight of cargo *designed* to be carried, being the difference between the load and light displacement (if it should please the legislature to require such registration) would supply all the information that could be fairly required for statistical purposes.

But, Sir, if the legislature *should* require such registration, and the builder *could* assume a load line not far from the mark,

where is the *light* line to come from? The line at which a vessel will swim with a perfect equipment of masts, yards, rigging, anchors, boats, and lastly, stores, water, and provisions for every conceivable duration of voyage! Having been a shipbuilder and ship-owner from my earliest years, I feel authorised to say that, within any reasonable range of correctness, it is simply impossible; and therefore the weight of cargoes attempted to be determined by such inadequate means would be worse than useless either for mercantile or statistical purposes. Hence we arrive at the conclusion that the present tonnage registration is all that can be really useful, and all that is really required, and is not likely to be damaged in public estimation by the labours of those who have been so assiduously, and I may add unscrupulously, toiling for its destruction.

I now leave Messrs. Atherton and Henderson to their meditations, little doubting that the eminent men, whose names you have published as members of the Committee of inquiry appointed by the British Association, will soon see the uselessness of the errand they are sent upon; and will consider well, before involving themselves in fruitless labours, by whose instrumentality, and the real purposes for which, they have been invited to assemble.

I am, Sir, yours, &c.,

VERITAS.

SCIENTIFIC INSTITUTIONS.

THE LONDON MECHANICS' INSTITUTION—THE ROYAL CORNWALL POLYTECHNIC SOCIETY.

To the Editor of the Mechanics' Magazine.

SIR,—Every lover of progress in science must regret the difficulties with which the London Mechanics' Institution seems surrounded. The parent of several hundreds of kindred institutions at home, without counting those located abroad, its present struggling existence is by many viewed as a reproach on the mechanics of the United Kingdom.

With this view, however, I do not concur, and, since the corner for discussion is not large, I will content myself by suggesting to those in power the propriety of carefully adapting the management and rules of such institutions to the requirements of the period. The rules and management may have been unexceptionable at the foundation of these institutions, but totally inapplicable at the present day. Very frequently the officers and patrons are retained for such lengthened periods that institutions have, to all intents and purposes, ceased to exist, other than in name. They have degenerated into mere party clubs, seldom entered by the intelligent mechanic, whose endeavours to infuse a little fresh vigour into the concern is, in nearly every case, frustrated by an antiquated set of rules, or some octogenarian managing genius. A few exceptions to this system may be found, where a show of doing something is persevered in; but the good which these accomplish is infinitesimally small compared with the good which might be done, were the managers only half as enlightened as the individuals whom they profess to judge and instruct. Among this lot I must class the Royal Cornwall Polytechnic Society, which has been in existence twenty-two years, but, like the London Mechanics' Institution, lately appealed to the public for assistance.

The Society professes to encourage and foster meritorious inventions, especially those more immediately applicable to the mining industry of Cornwall. On looking over its annual reports, however, it is difficult to see in what way it affords encouragement to struggling genius. It particularly prides itself on having rewarded with the sum of ten pounds a clumsy substitute for the system of lowering and lifting miners in use in the English and Welsh coal mining districts—a substitute so thoroughly inapplicable, by reason of its costliness and unwieldy dimensions, that, in the twenty-two years which have elapsed since the date of the reward, only three or four have been adopted, or about one apparatus to every hundred mines. Yet the Society's connection with this apparatus is paraded at each meeting as something very gratifying to the founders.

The last meeting was held in September, and a perusal of the report shows the Society to have passed the meridian of usefulness—to have attained, in fact, a position worse than useless. The encouragement given towards the practical improvement of mining operations is nowhere to be seen. Bessemer's patent process, for making malleable iron and steel in a few minutes, and at a comparatively trifling expense, was the all-engrossing topic. The office of puffing this invention in a remote corner of the empire, totally devoid of iron or steel manufactures, was undertaken by a *gobemouche* from the Museum of Practical Geology, who came duly armed for the purpose with several pieces of cast steel, malleable iron, &c. It is now generally believed that Mr. Bessemer has not yet produced any cast

steel by his process, and it is a question whether one atom of malleable iron has really been made in accordance with the patent; but the learned authority of Jermyn-street was evidently sent fully primed for the occasion, and a true history of the specimens was foreign to his business. This gentleman afterwards reviewed the labours of Liebig; but his fitness for this task may be judged of by this one sentence:—"We have heard some talk of the burning of the iron, and sundry other things: but all this, I believe, may go for nothing."

A second silver medal was awarded for a tin dressing machine, which was pronounced a very ingenious invention. This would seem a redeeming feature of the meeting; but how stands the case? The inventor was an experienced tin dresser; his apparatus (illustrated by a model, but in work on the large scale) embodied such practical points as his experience and ingenuity suggested; and though calculated to benefit many large mines, was considered by the society to be sufficiently rewarded with a small silver medal. The society give no rewards to patented inventions, and the medal is given on the condition of the invention becoming public property. I think there are few men of talent who will envy the recipient of the medal. But the worst remains to be told. Having given a medal to the inventor, they tack on to their award their opinion that it is not adapted for general practice! Thus, what little encouragement was given is directly extinguished in a most authoritative manner. On reviewing the reports for many years past, the same spirit is manifest in every invention pertaining to mining—a trifling reward, followed by the society's sinister opinion that the invention is practically worthless. How inventions can be so deserving of rewards, and yet merit an underhand system of condemnation, is known only to the managers of the society. Can it be a matter of surprise that the society is falling into contempt and pecuniary difficulties?

Another apparatus, designed for tin dressing, was rewarded with a bronze medal: this was all the encouragement which the society afforded struggling inventors of mining and engineering machinery. Lads, for rude models of steam engines, were rewarded with a liberality showing that, in the opinion of the society, they were more worthy of encouragement than original inventors, such as those of the tin-dressing machines. Carvings, oil and water-colour paintings, school drawings, &c., carried off the principal awards given by a society which rests its claims for public support on the great assistance rendered by it to deserving inventors of improvements in practical mining and engineering.

For many years past a premium has been offered for a mode of ventilation applicable to Cornish mines, the recesses in many of which are notoriously in a state worse, if possible, than the atmosphere of the Black Hole at Calcutta. It is computed that every year some hundreds of lives are destroyed through absolute want of vital air, for the returns of deaths in the mining districts show the appalling mortality of more than 50 per cent. of the deaths by consumption. Many designs and models have been sent in, but, in the opinion of the society, none of them displayed any merit. The ventilation of the mines, meanwhile, is totally neglected, and the proprietors, in answer to suggestions, refer to these abortive proceedings of the society as evidence that ventilation is impracticable with present means. In this case its interference has been a positive evil to all concerned; for, if left to their own energies, the intelligent mine agents of the district would, ere this, have remedied the ventilation, and relieved Cornwall from the reproach of containing the most unhealthy mines found in any quarter of the globe.

But the absurd conditions attached to the premium are such as no other society would have annexed, and show very clearly a want of sincerity in the matter. Besides the essentials of originality, special adaptation to Cornish mines, cheapness, simplicity, efficiency, &c., the inventor must throw his invention open to the world on receiving the sum of *ten pounds;* he is precluded from patenting or obtaining any other reward for his invention. If he meets these conditions, on receiving the ten pounds, the merit of the invention passes from him; he must submit to see his invention paraded as the Polytechnic Society's ventilator.

A premium of ten pounds, payable only under the conditions stated, to the individual who may, by the exercise of his talents, discover the means of saving some hundreds of lives annually—a reward of less than *one farthing* for the life of each man saved to the country—exhibits such a low estimate of value on human life, and is treating the ingenious inventor with such undisguised contempt, that I trust you will find room to record in your columns such an instance of Cornish liberality.

I am, Sir, yours, &c.,

COSMOPOLITAN.

December 23, 1856.

MODERATOR LAMPS.

To the Editor of the Mechanics' Magazine.

SIR,—Notwithstanding what Mr. Broadstadt says, I still stand to what I said, that camphine is less combustible, or at least less liable to explode than naphtha; neither can I see why the unconsumed portion should not be caused to flow into a cistern placed below the burner, and from thence be allowed to filter through to its original receptacle. To remedy the partial transformation to a resin, the camphine should be re-distilled and preserved in well-corked vessels.

I am, Sir, yours, &c.

A DUBIOUS READER.

BONNEY'S IMPROVED SYSTEM OF TRANSMITTING ORDERS ON BOARD SHIP.

THE acoustic system of communicating from deck to deck, or from or to aloft on board ship, having answered so well in the British Navy, the Admiralty have ordered all ships to be supplied with the tubes; and the patentee, Mr. William Wolfe Bonney, has just returned from Cronstadt, where he has been fitting his tubes to the new 84-gun steam-ship *Retnizan*. All the other ships of the Russian Navy at Cronstadt are also ordered to be fitted in the Spring with the like means of communicating, in any weather or circumstances, orders from and to any part of the ship.—*Times.*

SPECIFICATIONS OF PATENTS RECENTLY FILED.

VIMONT, A. S. *A new system of machine for spinning wool and any other fibrous material.* Dated Apr. 22, 1856. (No. 959.)

This invention consists principally in certain contrivances by means of which the two chief operations of drawing and spinning are effected, and in the use of a spindle of a novel construction. It cannot be described without engravings.

NEWTON, A. V. *A new method of obtaining purified oil from coal, shale, and other bituminous substances.* (A communication.) Dated Apr. 22, 1856. (No. 960.)

This invention consists in straining the gas which produces the oil by passing it through strata of sand or other suitable medium.

NICKELS, C., and J. HOBSON. *An improvement in machinery for weaving carpets and terry fabrics.* Dated Apr. 22, 1856. (No. 963.)

This invention is applicable when weaving with looms driven by power, wherein the wires to produce the terry or pile are introduced by hand. It consists in causing the power to be applied to a loom during the time of putting in the wires when only one shuttle is used. For this purpose a shed is open to receive a wire, and at the same time a shed to receive the shuttle, the power acting to throw the shuttle at the time a wire is being introduced by the workman.

LLOYD, D. *Improvements in washing minerals, coal, and ores.* Dated Apr. 22, 1856. (No. 964.)

This invention consists in applying compressed atmospheric air for giving the necessary motion to the water in machines used for washing minerals, coals, or ores.

JEACOCK, T. *An improvement in knitting-machinery.* Dated Apr. 22, 1856. (No. 965.)

This invention is designed to dispense with the use of pressers, and in place thereof to apply to each needle a slide or instrument, which will be caused to act by the movement of the work on the needles. It is applicable when using either single or double-ended needles.

ARMSTRONG, W. G. *Improvements in apparatus for lifting, lowering, and hauling.* Dated Apr. 22, 1856. (No. 967.)

This invention relates to hydraulic apparatus. The improvements have for their object the obtaining of variation of power by the use of one external cylinder or press instead of two or more, and consists in applying two or more concentric rams or plungers, or a combined piston and ram, or both, to such cylinder.

BROOMAN, R. A. *Improvements in or connected with centrifugal machinery.* (A communication.) Dated Apr. 22, 1856. (No. 968.)

This invention consists in an arrangement for driving the shaft of centrifugal machinery by means of levers or arms, or by means of a gin or horse-gear acting directly on toothed wheels in gear with the shaft. The improvements also include the use of a break, and arrangements for lubricating the bearings, &c. The machinery is so arranged as to be readily taken to pieces.

FORSTER, G. *Certain improvements in the arrangements of trap-doors or air-doors and their cases in the workings or passages in mines, whereby the efficient ventilation is maintained, which said improvements are also applicable in other similar situations.* Dated Apr. 23, 1856. (No. 970.)

The patentee arranges double doors at suitable distances apart in the workings or passages, and so connected with each other, by means of a connecting rod or bar combined with suitable levers, that the opening of one door will necessarily close the other

or that next behind it, and thus prevent the rush of air passing directly through both doors, as the second door cannot be opened until the first is effectually closed.

Garnett, J. *Improvements in twisting, winding, and reeling yarn, and in machinery or apparatus employed therein.* Dated Apr. 23, 1856. (No. 972.)

This invention consists,—1. In giving an extra amount of twist on the winding, reeling, or other suitable machine, to yarn that has been spun in the usual manner, whereby weft may be converted into twist. 2. In the application of four instead of two bobbins to each drum of the ordinary drum winding machines, to economise space. 3. In placing the skewers for the cops of ordinary winding or reeling machines in a vertical instead of a diagonal position. 4. In dispensing with the brushes usually employed to clean the yarn during the winding and reeling, and to effect the cleaning and impart the requisite tension to the yarn by passing it around studs covered with flannel or other suitable material.

Savage, W. P. *A machine for drilling and rolling land.* Dated Apr. 23, 1856. (No. 973.)

This invention was described and illustrated at page 577, of No. 1741.

Squire, T., and C. F. Claus. *Improvements in the manufacture of artificial manure.* Dated Apr. 23, 1856. (No. 974.)

This invention consists in dissolving animal substances, such as hair, wool, hoof, horn, woollen rags, shoddy, or other substances chemically similar, by means of liquids containing sulphuret of calcium, sulphuret of ammonium, or sulphuret of magnesium (alone or mixed), with any of the preceding or above-mentioned substances.

Perring, J. S. *Improvements in chairs for railways.* Dated Apr. 23, 1856. (No. 975.)

This invention consists in the application to railway chairs of a wedge or key acting by its own gravity.

Balmain, W. H., and T. Colby. *Improvements in the manufacture of alkalies from their sulphates.* Dated Apr. 23, 1856. (No. 976.)

This invention consists in converting alkaline sulphates into carbonates by means of carbonate of barytes.

Barbour, J. *Improvements in sawing apparatus.* Dated Apr. 23, 1856. (No. 977.)

The saw blade to be used is made in the form of an endless belt, which is passed round two pulleys, and kept properly stretched by screw or other adjustment, by which the bearings of the two pulleys can be separated more or less.

Stocker, A. S. *Improvements in the application of certain materials to the manufacture of ink and other stands, and other articles, and in the manufacture and finishing of articles produced out of such or other material or materials.* Dated Apr. 24, 1856. (No. 980.)

This invention consists in the application of pigments, colours, whiting, farinaceous or other substances severally combined, or one of these ingredients alone mixed with glue, resin, oil, water, paper, gutta percha, or other material, to form a plastic body to the manufacture of inkstands, &c. Also in the staining, colouring, polishing, beautifying, and finishing them when so made, by any well-known methods.

Schratz, A. D. *Improvements in preparing colours for the impression of woven or textile fabrics or stuffs of any kind.* Dated Apr. 24, 1856. (No. 981.)

This invention consists in making use of linseed for thickening the colours for their preparation for printing textile stuffs or fabrics of any kind.

Yeomanson, J. and W. *Improvements in the manufacture of knitted fabrics.* Dated Apr. 24, 1856. (No. 982.)

This invention relates to that class of knitted fabrics in which the direction of the loops is from time to time reversed, they at one time being caused to front one surface and then the whole thereof. Knitting machinery has been arranged to produce such fabric in the working thereof, and the improvements consist in the employment of an additional row of needles or hooks pointing in the same direction, and working above and in the eye of the frame needles.

Doat, V. *An improved galvanic battery and method of recovering and revivifying the agents employed.* Dated Apr. 24, 1856. (No. 987.)

1. Mercury, either pure or in amalgam, is employed, as the electro-positive metal. 2. Iodide of potassium, or any other alkaline or earthy iodide, is used instead of the acids or salts in solution of ordinary batteries. 3. Iodine dissolved in an alkaline iodide is used instead of the substances usually employed to surround the negative pole, prevent polarisation, and produce constant effects. The patentee employs carbon as the negative pole. The method of recovering or revivifying the agents is as follows:—After the battery has been at work, the saturated solution is drawn off, and the patentee recovers, 1. The iodide of potassium, by heating the liquid in a capsule with a receiver at top, when the per-iodide of mercury formed during the action of the battery will be volatilised. 2. The mercury is recovered by heating the per-iodide with dissolved caustic baryta,—oxide of mercury,

and iodide of barium will be formed. To separate the oxide of mercury, the patentee heats it in a capsule covered by a receiver. 3. The iodine is recovered by heating the iodide of barium in presence of the oxygen, resulting from the decomposition of the oxide of mercury, and conducted to the iodide through a tube. The iodine, driven off by the oxygen, will be condensed in the receiver over the capsule containing the iodide of barium, and the caustic baryta which will remain may be used again. The patentee also describes a cold process for recovering the iodine, iodide of potassium, and mercury.

NEILSON, W. *Improvements in locomotive engines.* Dated Apr. 24, 1856. (No. 988.)

This invention relates to locomotives particularly suited for working mineral lines of railway, or for goods traffic. They have each a single horizontal cylinder beneath the fire-box end of the boiler, and four coupled wheels; the cylinder end is just clear of the hind axle. The piston-rod works out beneath the foot-plate of the driver in the longitudinal centre line of the engine, the stuffing-box being in the after cover of the cylinder. The projecting end of the piston-rod carries a long cross head, the two ends of which are entered into parallel guide-slots in bracket pieces depending from the framing, and to each end of this cross head is jointed the after end of a long outside connecting-rod, which passes forward outside the framing to a crank-pin in the after driving wheel. The wheels are coupled to work in concert, and provision is made for securing a better action on passing the dead centres, by arranging the coupling pins on one side of the engine a quarter of the circle round in advance of the same parts on the other side. With this arrangement the connecting rods can never act in opposite directions. Where increased power is required, a second cylinder may be placed at the forward end of the engine. The slide valve is on the upper side of the cylinder, and is worked by a single eccentric on the front axle fitted with a double forked eccentric rod for reversing. The boiler is a plain even cylinder, and the water tank is in the form of a saddle upon its front portion. For the regulation of the feed water a lever is arranged on the top of the boiler within reach of the driver, the opposite end being jointed to a pendant-rod passing into the tank, and leaving at its lower end an elastic disc piece guarding the open end of the water pipe. The fire-box is prolonged to a considerable distance into the barrel of the boiler, and is fitted with a brick bridge a short distance from the tube plate.

BLACKETT, F. W. *An improvement in the construction of keys and locks, and in the fitting of locks to afford increased safety.* Dated Apr. 24, 1856. (No. 989.)

In constructing keys for the locks of safes, &c., the patentee fits the wards to the barrel or stem, in such manner that they may be readily removed when the key is not in use. The key being thus made for a time unserviceable, may be hung up near the safe while the wards are retained in safe custody.

HARDACRE, J. *Improvements in the arrangement and construction of carriages and carriage wheels.* Dated Apr. 25, 1856. (No. 993.)

The inventor constructs a carriage so that the hood or cover may be raised by the driver without removing from his seat. He also makes carriages with several sides, so as to form several seats, which can either be boxed up or open. His improved wheels are made with elastic or flexible spokes of any desired curve, so that their elasticity may be maintained. He fastens bushes or collars to the ends of axles in general, for allowing the wearing parts to be replaced when necessary. To supply oil, either to his improved wheels or to those in general use, he attaches to the end of the metal nave, or the bush for the nave, an oiling apparatus furnished with a plug, kept in its place by a spring when not pulled out for admitting oil.

SWIFT, C., and J. J. DERHAM. *Improvements in steam engines.* Dated Apr. 25, 1856. (No. 994.)

The patentee proposes to work steam expansively in two cylinders, by using only one set of slide or conical valves and side pipes to the low pressure cylinder, the said slide valves having single or double facings at angles, or straight facings and passages so arranged as to regulate the due supply and exhaust of steam to each cylinder alternately, thereby dispensing entirely with the side pipes and valves to the high pressure cylinder, decreasing the radiating surface, and causing the steam in its passage from one cylinder to the other to occupy a much smaller volume than in the arrangements heretofore employed, and consequently preventing the important loss arising from the cooling and expansion of the steam and corresponding decrease in its elastic force which occurs when the side pipes are too large, or when two sets are used. Conical valves are also applied if required in place of slides in the valve box.

FRAETANIEL, I. D. *An improved safety rein or bridle.* Dated Apr. 25, 1856. (No. 995.)

Claims.—1. The employment of a rein attached to the two legs of a horse, which rein passes through a ring suspended from

the martingale, and the end of the rein passing to the hand of the driver. 2. Connecting the supporting ring to the martingale, by a rod of caoutchouc or any other substance forming a spring in order to allow the ring to yield to the draught of the bridle during the movements of the horse. 3. A graduated indicator showing the action of the bridle or rein upon the horse's legs.

GOSSAGE, W. *Improvements in the manufacture of sulphuric acid.* Dated Apr. 25, 1856. (No. 996.)

This invention provides certain modes for effecting a more rapid production of such acid, and for causing extensive humid surfaces to be presented to the mixed gases employed, such surfaces being continually moistened by the liquid acids produced by the mutual reaction of such mixed gases, or by other liquid acids supplied thereto. The invention cannot be fully described without engravings.

LAKIN, R., J. THOMPSON, E. G. FITTON, and F. A. FITTON. *Improvements in or applicable to certain machines for preparing and spinning cotton and other fibrous substances, some of which improvements relating to apparatus for lubricating, and to the construction of studs, are also applicable to machinery for other purposes.* Dated Apr. 25, 1856. (No. 997.)

These improvements relate—1. To self-acting mules, and consist in passing the scroll band used for drawing in the carriage partially round a pulley or stud attached to a slide or moveable lever, &c., in order to cause the carriage to come in more evenly than by the means usually employed. 2. To mules, whether self-acting or hand mules, and consist in a mode of continuing the rotation of the drawing rollers, and consequently the delivery of the roving after the completion of the outward run of the carriage, but at a slower speed, thus giving a continuous motion to the drawing rollers so long as the mule is at work. 3. To the construction and application to the upper part of the spindles used in slubbing and roving frames of an improved top bearing to render the spindles more steady. 4. Also to slubbing and roving frames, and consist in an improved mode of regulating the drag or friction of the roving in passing from the tubular leg of the flyer to the bobbin, by shortening the legs of the flyers, and extending and cranking the stem of the presser, thereby bringing the presser down below the tubular leg of the flyer to the same pressing point it would have come to had the leg of the flyer not been shortened. 5. To certain apparatus for lubricating the spindles in mules, roving frames, &c., and also for lubricating bushes, journals, shafts, &c. 6. To an improved apparatus for lubricating spindles in such preparing, spinning, and other machines in which a lifting rail is used. 7. To an improved apparatus for lubricating the bearings of rollers used in preparing and spinning machines. 8. To forming studs, whether to be applied in such preparing and spinning machines, or in machinery for other purposes, partly of wrought iron, and partly of cast iron, the bearing portion of the stud being a tube or other hollow piece of cast iron fitted on and fixed to its place by a bolt or screw of wrought iron.

HILL, T. *Improvements in steam boilers and furnaces connected therewith.* Dated Apr. 26, 1856. (No. 998.)

The patentee fixes a grid or perforated plate in the furnace door, the apertures of which can be closed partially or wholly, by a sliding plate or door, so as to regulate the quantity of air admitted. He also fixes air tubes extending from the front of the boiler to any desired part of the furnace behind the bridge, or to a combustion chamber when one is employed. He also places a perforated plate at the front of the bridge below the fire bars to admit air, and closes it, when desired, by a sliding plate. For obtaining increased heating surface he uses tubes or small flues much larger in diameter than those hitherto used in tubular boilers. For boilers with internal flues he employs stays consisting of boiler plate and angle iron, and for all boilers with flat ends he attaches the longitudinal stays to two pieces of angle iron extending entirely across the end plates of the boiler. He also employs fire bars having transverse projecting ribs on their upper surfaces, for slightly raising the fuel from the apertures, thereby allowing a free admission of air.

TOPHAM, E. *Apparatus for cleansing out the sediment from the water in steam boilers and preventing incrustation of the same.* Dated Apr. 26, 1856. (No. 1000.)

The inventor adapts to the interior of steam boilers, and in the direction of the length thereof, rotating rods or spindles around which is fixed a series of detached plates, or one continuous plate or blade constituting a screw, the purpose of which is to remove the sediment.

NEWTON, W. E. *Improved machinery for manufacturing painted or enamelled cloth.* (A communication.) Dated Apr. 26, 1856. (No. 1002.)

The patentee claims an arrangement of several rollers and belts wherein the friction of the cloth on a roller is made use of for giving the necessary tension and movement to the cloth, in combination with means of spreading the paint or composition, and the delivery of the cloth when coated. He also

claims the use of a hanging frame for receiving the cloth for drying, thereby rendering the painting and hanging of it a single mechanical operation.

ARNAUD, C. A. *Improvements in obtaining motive power from steam and other fluids, and in pumping and forcing water and other fluids.* (A communication.) Dated Apr. 26, 1856. (No. 1003.)

This invention consists in obtaining a power by steam and other fluids, and in pumping and forcing water and other fluids by the use of an apparatus consisting of two cylinders, &c., working together in a peculiar manner.

WALKER, T. *Improvements in playing cards.* Dated Apr. 26, 1856. (No. 1004.)

This invention consists in making playing cards of a circular form, or of a hexagonal, octagonal, or other figure, having a number of sides more than four, but he prefers the circular form. Also, in placing the spots or marks indicating the value of the cards out of the centre and near one edge of the circular cards, so that when the cards are properly arranged in the hand, the player can see the character of all the cards, the parts overlapping each other being blank.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

STROUD, J. T. *Improvements in stop-cocks or taps for regulating or cutting off the passage of gas to combined gas burners.* Dated Apr. 22, 1856. (No. 956.)

These improvements consist of a tap or stop-cock adapted to regulate the supply of gas in such manner that gas may be supplied to several burners in combination successively, and whereby the gas may be supplied to the whole number of burners with which it is in connection, or to any number less than the whole at pleasure.

BROWN, P. and G. *Improved apparatus applicable to furnaces, fire-grates, fire-places, or stoves, for the purpose of economizing fuel and heat.* Dated Apr. 22, 1856. (No. 961.)

This invention consists in the arrangement of a retainer or separator, in combination with a dust and residue receiver, so that the larger unburnt or partially burnt portions of fuel may be separated from the refuse dust and ashes, and left in a suitable state to be again supplied to the fire.

SMITH, W. *Improvements in constructing and applying windlasses for working ploughs and other agricultural implements.* Dated Apr. 22, 1856. (No. 962.)

In this invention the barrels of the windlass are mounted in a carriage with shafts to receive a horse. Two barrels are used, capable of turning, independently of each other, freely on the axle. Each of the barrels has fixed thereto a cog wheel, and the one or other barrel will be caused to rotate according as the pinion on another axis is slided into gear with one or other of the two cog wheels. The pinion axis receives motion by a cog wheel thereon, being driven by another cog wheel on an axis which receives its motion from a steam-engine on a separate carriage.

BLACKWELL, T. E. *An improvement in treating water for the use of brewers.* Dated Apr. 22, 1856. (No. 966.)

Water which is soft, or comparatively soft, is caused to be filtered through carbonate or sulphate of lime, the action being aided by the use of carbonic acid gas, such materials being used in combination with other filtering media to separate mechanically mixed impurities.

MYERS, I. and G. *An improved fire-lighter.* Dated Apr. 23, 1856. (No. 969.)

This invention consists in making fire-lighters, by mixing together the following articles, viz.:—Sawdust, 112 lbs.; small coal or coke, 28 lbs.; tar, pitch, or rosin, 112 lbs., or thereabouts. The mixture is moulded into cakes, and each cake enveloped in paper.

BULLOUGH, A. *Improvements in looms.* Dated Apr. 23, 1856. (No. 971.)

1. With the ordinary loom used for weaving plain or twilled fabrics, the inventor uses a mounting, so that the ordinary loom weaves the plain or twilled part whilst the mounting introduces the fancy pattern without the use of the jacquard apparatus. 2. He throws a check of one or more colours into the cloth at stated intervals with one shuttle, without the assistance of the drop box, by arranging the shuttle so that the card will catch the required yarn or thread, and throw it into the shed. 3. He uses metal shafts instead of wood, which by their own weight draw down the healds instead of springs or weights. 4. He uses the healds as a medium to prevent floats being made.

WARD, P. *An improvement in furnaces used in the manufacture of alkali.* Dated Apr. 23, 1856. (No. 978.)

In this invention the reverberatory furnaces, and the furnaces of the salting down pans employed, are each made with a chamber or space open at top, between the end or bridge of the fire-place and the bridge at the entrance of the reverberatory part of the furnace or pan. This chamber is intended to trap or catch the dust, sparks, and matter passing from the fire.

BROWN, D. *A new or improved method of joining the rails of railways.* Dated Apr. 23, 1856. (No. 979.)

The inventor rolls or otherwise forms the ends of the rails of a figure nearly re-

sembling that which would be produced by slitting a rail in a vertical plane, in the direction of its length. He makes a recess in the inside vertical face of the end of one of the rails, and a corresponding projection on the other. The ends are secured together by pins or rivets. The junction extends through two or more of the chairs, and that part of the rail situated between the upper and lower heads of the rail is of somewhat greater thickness as far as the joint extends.

WOODCOCK, T., and J. K. PUNSHON. *A machine for cutting and slicing bread and other substances.* Dated Apr. 24, 1856. (No. 983.)

This invention consists of a bed upon which the loaf (or other substance) is placed and held against upright supports. Knives are made to pass forwards and downwards at the same time, by means of parallel rods connecting the knives at both ends to the bed. On the parallel rod furthest from the handle is placed a stop regulated by a screw to give the thickness of the slice.

ASHWORTH, G. *Improvements in machinery for preparing slivers or slubbings of wool and other fibrous materials, commonly called "condensing carding engines."* Dated Apr. 24, 1856. (No. 984.)

This invention consists in applying the common carding engine to the preparing of slivers or slubbings of wool, &c., with this difference, that instead of the entire surface of the cylinder or cylinders, rollers, workers, clearers, &c., being covered with cards, they are furnished with separate belts of cards, each belt operating upon a separate sliver fed to it.

COWPER, C. *A new yarn or thread, and its application in the manufacture of stockings, gloves, and looped and other fabrics.* (A communication.) Dated Apr. 24, 1856. (No. 985.)

This invention consists in the manufacture of a yarn or thread from silk waste, or the waste silk obtained in reeling the cocoons, in combination with short or waste alpaca, and the application of the same to the manufacture of gloves, stockings, &c.

ALLMAN, F., and D. BETHUNE. *Certain improvements in apparatus for the production of steam, and in the apparatus employed in its application to motive purposes.* Dated Apr. 24, 1856. (No. 986.)

This invention is described "as being the generation or production of steam in two or more vessels, one of such vessels being similar to any ordinary boiler, namely, a vessel containing water to be converted into steam by the application of heat, and a steam space in which such steam can be retained or accumulated. A second vessel or calorifier is employed, into which the steam from the boiler is passed, and to which second vessel or calorifier heat is applied so as to surcharge or desiccate the steam contained therein."

MOORE, T. *Improvements in machinery for riddling and winnowing or cleaning corn and other grain.* Dated Apr. 24, 1856. (No. 990.)

The inventor describes a certain machine in which he combines the arrangements for thrashing, shaking, riddling, and winnowing, placing his improved winnowing apparatus across the back end of the thrashing and riddling machine, and mounting the whole on wheels where desirable, so that it may be moved from place to place.

NAAR, W. *Improvements in folding or adjusting articles of furniture.* Dated Apr. 25, 1856. (No. 991.)

This invention relates to the construction of couches, sofas, &c., in such manner that they may be easily and accurately adjusted at different supporting angles to accommodate the wishes of the user. As applied to an ordinary couch, the invention is carried out by making both the back and the arm or end piece moveable.

ELLIOT, G., and W. W. PATTINSON. *Improvements in the production of per-oxide of manganese.* Dated Apr. 25, 1856. (No. 992.)

This invention consists in acting on mixtures of peroxide and protoxide of manganese by weak acids, which dissolve off the protoxide, leaving the peroxide, and the inventors prefer the use of muriatic acid for the purpose, because in alkali manufactures a considerable quantity of it is produced of little or no value.

LAWES, T. *Improvements in the construction and manufacture of an implement used in tilling the land.* Dated Apr. 26, 1856. (No. 999.)

These improvements refer to the digging machine, and consist in the method of lifting the same up out of, and letting it down again into the ground, which is necessary for turning round when the machine is at work, and which is performed by the use of eccentric wheels.

HILLES, M. W. *Improved apparatus, applicable to the treatment and cure of rupture, prolapsus uteri, and other protrusions of the viscera.* Dated Apr. 26, 1856. (No. 1001.)

The object is first to retain pressing pads or cushions in the required position—and secondly, to give greater ease to the patient wearing such appliances. The inventor employs pads which expand or contract at the desire of the patient, and so increase or diminish the pressure upon the part affected. The pad he constructs of two dish-shaped plates, covered with soft leather, and con-

nected together by a central regulating screw, provided with a milled head.

VACHEROT, A. *Improvements in the construction of submarine tunnels.* Dated Apr. 26, 1856. (No. 1005.)

The tunnel itself is composed of a number of short lengths completed previous to being submerged, and when submerged rivetted together. Each section or length consists of two D-shaped iron chambers, open at both ends, and placed one inside the other; the space which intervenes is filled in with concrete or any cement or mortar which hardens under water. These sections are deposited by suitable tackle upon the bed of the sea, and their subsequent levelling is effected by rods which project outside the flat bottom of the sections, and are connected each to a foundation stone, so that when lowered to the bottom the stones will adjust themselves individually to the surface of the bed, whilst the rods, which are passed through suitable sockets in the base of the section, will slide therein, and protrude more or less, according to the nature of the ground.

PROVISIONAL PROTECTIONS.

Dated September 8, 1856.

2092. Boniface Sabatier, of Paris. Improvements in photography.

Dated October 8, 1856.

2358. David Joy, of Leeds, engineer, and William Holt, of the same place, organ builder. Improvements in hydraulic motive power engines, and the application thereof to certain useful purposes.

Dated October 21, 1856.

2476. William Edward Newton, of Chancery-lane, civil engineer. Improved machinery for rolling and forging iron or steel. A communication.

Dated October 31, 1856.

2559. Didier Elizabeth Ernest Ausset de Chavannes, of Paris, and of Essex-street, Strand. Improvements in cleaning all sorts of cloth fabrics and skins, by the application of a substance so called carburine.

Dated November 19, 1856.

2728. Thomas Gilman, of Creed-lane, Ludgate-hill. Improvements in boxes or packing cases.

2737. James Yearsley, of Saville-row, St. James', Member of the Royal College of Surgeons. An improved method of and instrument for applying artificial tympanums.

Dated November 20, 1856.

2744. William Irlam, of Newton-heath, near Manchester, engineer, and John Phillips, of the same place, railway station master. Improvements in working railway signals or alarums.

Dated November 28, 1856.

2818. Robert Griffiths, of Mornington-road, Regent's-park, engineer. Improvements in vessels and engines for propelling vessels.

2820. Henry Waller, of Lickhill, near Calne, Wilts. Improvements applicable to vessels used in the manufacture of cheese.

Dated November 29, 1856.

2827. Lemuel Wellman Wright, of Sydenham, engineer. Improvements in machinery for bending plates for the formation of pipes and tubes.

Dated December 1, 1856.

2840. George Collier, of Halifax, and James William Crossley, of Brighouse. Improvements in apparatus used in hot pressing, and in the means of manufacturing parts of apparatus used for such purpose.

Dated December 3, 1856.

2862. James Mizen, of Deptford. Improvements in apparatus for making gas, partly applicable to culinary or other domestic purposes.

Dated December 6, 1856.

2894. William Hadfield Bowers, of Gorton, Lancaster, manufacturing chemist. Improvements in apparatus to be used for the purpose of distillation.

2896. Christian Schiele, of Oldham, Lancaster, engineer. Certain improvements in machinery or apparatus for cutting nuts, screws, or bolts, and toothed wheels.

2898. John Longbottom, of Leeds, engineer. Improvements in generating, surcharging, or superheating steam.

2900. Henry Twisleton Elliston, of Leamington, Warwick, professor of music. A new or improved method of hanging and closing doors.

2902. John Leslie, of Conduit-street, Regent-street. An improvement in stoves and fire-places.

Dated December 8, 1856.

2904. George Collier, of Halifax, and Edwin Heywood, of Sutton Crosshills, near Leeds. Improvements in steam boilers or steam generators.

2906. John Aston, and John Brant, of Birmingham, button makers. An improvement in the manufacture of covered buttons and covered ornaments.

2908. James Blain, of Belfast, manufacturer. Improvements in Jacquard apparatus for weaving.

2910. Robert Frederick Miller, of Hammersmith. A mode of printing tables of fares, advertisements, notices, tablets, ornamental designs, figures, and other like announcements on painted or other surfaces to supersede writing.

Dated December 9, 1856.

2912. Josiah Harris, of Frodsham, Chester. A "Pneumatic Signal Apparatus," and mode of working the same.

2914. John Browning, of the Minories, philosophical instrument maker. Improvements in stereoscopes.

2920. Joseph Walton, of Styal, near Wilmslow, Chester, licensed victualler. Improvements in tables.

2922. Edmund Knowles Muspratt, of Liverpool, and Balthasar Wilhelm Gerland, Ph. D., of Hesse Cassel, now residing at Manchester. Improvements in treating waste liquors produced in the manufacture of chlorine, and in separating nickel, cobalt, and copper from liquids containing them, in combination with manganese and iron.

2924. Frederick Oldfield Ward, esquire, of Cork-street, Middlesex, and Frederic Wynauts, captain, of Brabant, Belgium. Improvements in the manufacture of manures.

Dated December 10, 1856.

2926. William Storey and Thomas Storey, of Lancaster, manufacturers of oil cloth and table covers. Improvements in forming ornamental devices on the surface of paper and certain prepared woven fabrics.

2927. Alexander Macarthur, of the Dalsholm Paper Works, Dumbarton, N.B. paper maker. Improvements in boiling, bleaching, washing, or cleansing fibrous materials.

2928. William Edward Newton, of Chancery-lane, civil engineer. Improved apparatus for sup-

plying steam boilers with water. A communication.

2929. Thomas Smith, of West Smithfield, umbrella and parasol stick manufacturer. An improved joint for folding handles or sticks of umbrellas and parasols.

2930. John Cornes, of Swan-lane, City, engineer. Improvements in chaff-cutting machines.

Dated December 11, 1856.

2931. Jacob Green, of Philadelphia, U. S. A. Improvements in the mode of manufacturing glass lights for street vaults, ships, buildings, and friction boxes, and the apparatus for ladling or conveying the molten glass from one furnace to another.

2934. Michael Burke, of Liverpool, cabinet maker. Improvements in mariners' compasses to counteract local attraction.

2935. Michael Burke, of Liverpool, cabinet maker. Improvements in the construction of anchors.

2936. Thomas Wheatley, of Openshaw, near Manchester, engineer, and William Wheatley, of the same place, pattern maker. Improvements in fog-signals and in the means of working the same.

2937. William Walker Reay, of Birmingham, corn dealer. An improvement or improvements in shoes for horses and other animals.

2938. Victor Delperdange, engineer, of Rue Verte, Schaerbeeck, near Brussels. Improvements in metallic and elastic packing.

2939. Richard Emery, of King-street, Saint James's-square, gentleman. Improvements in the construction of certain kinds of agricultural implements (for breaking clogs of earth and levelling the soil), called harrows.

2940. William Lund, of Fleet-street, manufacturer. An improved "spring-clip," for holding or retaining loose papers, or other loose articles.

2941. George Collier, of Halifax. Improvements in machinery or apparatus for the manufacture of piled fabrics.

2942. Frederick William Anderton, of Bradford, York, worsted spinner, and Joseph Beanland, of the same place, engineer. Improvements in apparatus or means in connection with furnaces to facilitate the consumption of smoke.

2943. William Charles Theodore Schaeffer, of Great Winchester-street, City. Improvements in distilling fatty and oily matters.

2944. William Player Miles, of the Patent Lock Factory, near the Forest-hill Station, London and Brighton Railway. Improvements in locks and fastenings. A communication.

2945. Charles Humfrey, of The Terrace, Camberwell. The application and use of paraffine in the manufacture of hair-oils, ointments and plasters for medical purposes.

2946. Henry King, of Frome, Somerset. Improvements in machinery for thrashing and dressing wheat and other grain.

2947. William Colborne Cambridge, of Bristol, agricultural implement maker. An improved construction of portable railway.

2948. Louis Joseph Frédéric Margueritte, of Paris, chemist. Improvements in purifying rock and sea-salt.

Dated December 12, 1856.

2949. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris. Improved railway signal apparatus. A communication.

2950. John Turner Wright and Edward Payton Wright, both of Birmingham, manufacturers. A new or improved manufacture of ropes, cords, lines, twines, and mill bandings.

2951. Rafaello Louis Giandonati, of St. Paul's Churchyard, merchant., Improvements in over shoes. A communication.

2952. Edward Paton and Charles Frederick Walsh, of Perth, N.B., gunmakers. Improvements in apparatus for charging and capping the nipples of fire-arms.

2953. William Foster, of Black Dike Mills, Bradford, York, spinner and manufacturer. Improvements in petticoats.

2955. John Cawood, James Beeson, William Smith, and Richard Henchley, all of Derby. Improvements in the valves of steam engines.

2956. James Hartas Headley, of Walpole, Canada, lumber-merchant. An improved mode of manufacturing artificial granite in various forms and plating or veneering the same with marble, so as to present an exterior of marble and an interior of stone or granite.

2957. Henry Pease, of Pierremont, near Darlington, esquire, and Thomas Richardson, of Newcastle-on-Tyne, chemist. Improvements in the manufacture of compounds of alumina.

2958. Samuel Newington, of Ticehurst, Sussex, M.D. Improvements in hand hoes and cultivators.

2959. William Beevers Birkby, of Upper Rawfolds Card Works, Cleckheaton, near Leeds. Improvements in the manufacture of pointed wire fillets used in the preparation of flax, tow, hemp, and other fibrous substances.

2960. George Sherwin, of Waterloo-road, Burslem, Stafford. Improvements in the manufacture of fire bricks, tiles, crucibles, and other articles, when fire clay is used.

2961. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton. Improvements in looms for weaving cut piled fabrics double. A communication from E. B. Bidgelow, of Boston.

Dated December 13, 1856.

2963. John Smith, of Failsworth, near Manchester, Jacquard machine maker and iron founder. Improvements in Jacquard machines for weaving.

2964. Louis Braun, of Wood-street, City, cap manufacturer. Improvements in caps and such like articles.

2965. John Metcalf, of Newton-heath, near Manchester, manufacturing chemist. Improvements in the manufacture of alum or sulphate of alumina.

2966. Henry Wickens, of Tokenhouse-yard, City, gentleman. A throat guard or apparatus for protecting the throat against garotting or other external violence.

2967. James Wadsworth, of Hazlegrove, near Stockport, Chester, machine maker. Certain improvements in heating and ventilating apartments, buildings, and ships, and in apparatus applicable to and to be used for such purposes.

2968. George Littlewood, of London-wall. Improvements in printing geometric patterns.

2969. Archibald Turner, of Leicester, elastic web manufacturer. Improvements in the manufacture of elastic fabrics.

Dated December 15, 1856.

2970. John Grant, of Hyde-park-street, esquire. Improvements in heating or cooking by gas, and in apparatus for effecting the same.

2971. John Millner, of Charlwood-street, Pimlico, iron worker. Improvements in chimney cans or caps.

2972. Luke Duncan Jackson, of Underwood, Nottingham, engineer. A pneumatic break or apparatus to be attached to railway carriages or trucks for the purpose of retarding or stopping the same.

2973. Auguste Fournier des Corats, of Rue des Trois Pavillons, Paris. Certain improvements in lamps.

2974. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improvements in machinery, for boring, turning, tapping, and screwing fittings for gas, water, steam, and other pipes, and in vices for holding the same while they are operated upon. A communication.

Dated December 16, 1856.

2975. William Austin, of Upper Portland-place,

Wandsworth-road, civil engineer. Improvements in pipes or tubes, and in the method of joining and laying the same.

2977. Edwin Heywood, of Sutton Cross Hills, near Leeds, designer. Improvements in machinery or apparatus used in weaving.

2979. William Carwood, of Back Church-lane, engineer. An improvement in steam engines.

2981. John Stobo, of Leven Bank Works, Dumbarton, N.B., foreman. Improvements in forcing or lifting corrosive or chemical liquids.

2983. William Edward Newton, of Chancery-lane, civil engineer. An improved process or processes of treating feldspar so that it may be used as a manure or for obtaining potash or soda therefrom. A communication.

Dated December 17, 1856.

2989. William Edward Newton, of Chancery-lane, civil engineer. An improvement in the manufacture of table knives. A communication.

2991. John Hall Brock Thwaites, of Bristol, dentist. A new or improved machine or apparatus for holding postage or receipt stamps and applicable wholly or in part to other similar purposes.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

3027. Daniel West, of Egremont-place, New-road, civil engineer. An improvement in presses constructed to operate by a combination of iron levers, which presses are employed to compress bales of cotton, hemp, wool, and other articles of merchandise. Dated 22nd December, 1856.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," December 30th*, 1856.)

1917. J. W. D. Brown and G. G. Brown. Improvements in signal lanterns.

1953. W. Akroyd and J. Thompson. The manufacture of carpets or other fabrics.

1955. T. York. A new or improved safety-valve and low-water indicator for steam boilers.

1959. T. J. Chipp and R. Bitmead. Improved apparatus for drilling and boring.

1962. W. E. Newton. Improved machinery for cutting chenille. A communication.

1971. A. Moses. Improved machinery for propelling vessels on water.

1982. G. Warriner. Improvements in compounds for preserving, deodorizing, and fertilizing.

1985. W. F. Bush and W. Hewitt. Improvements in machinery or apparatus for grinding grain.

2009. J. B. Feauveau and L. A. Legrand. An improved apparatus for the purification and the combustion of gas.

2017. A. L. A. Herbelot. Improvements in obtaining motive power by gases or fluids.

2024. M. Bower, R. Peyton, and J. W. Downing. Improvements in metallic bedsteads, cots, couches, and other such like articles.

2045. S. Ghidiglia and L. Turletti. An improved buckle.

2052. C. J. Duméry. Improvements in steam engines.

2063. R. A. Brooman. Improvements in the construction of buildings and parts of buildings. A communication.

2066. J. Johnson. Improvements in railway carriages.

2144. R. Peyton. An improvement or improvements in the manufacture of metallic bedsteads, and other articles for sitting, lying, and reclining upon.

2358. D. Joy and William Holt. Improvements in hydraulic motive-power engines, and the application thereof to certain useful purposes.

2371. L. J. Jordan. A medicine for the cure of venereal affections.

2411. A. Turner and L. Turner. An improved manufacture of elastic fabrics.

2446. J. F. Deshayes. Improvements in machinery for dyeing silk, cotton, or wool in hanks, or skeins, or woven fabrics.

2476. W. E. Newton. Improved machinery for rolling and forging iron or steel. A communication.

2694. A. Symington. Improvements in apparatus for drying yarns and woven fabrics.

2750. R. B. Benson. Improvements in reefing sails.

2813. R. Griffiths. Improvements in vessels and engines for propelling vessels.

2820. H. Waller. Improvements applicable to vessels used in the manufacture of cheese.

2821. A. Turner. Improvements in the manufacture of elastic fabrics.

2908. J. Blain. Improvements in Jacquard apparatus for weaving.

2919. J. R. Scartliff. Improvements in apparatus to be employed as an alarm and detector in cases of burglary.

2927. A. Macarthur. Improvements in boiling, bleaching, washing, or cleansing fibrous materials.

2951. R. L. Giandonati. Improvements in over-shoes. A communication.

2957. H. Pease and T. Richardson. Improvements in the manufacture of compounds of alumina.

2981. J. Stobo. Improvements in forcing or lifting corrosive or chemical liquids.

2991. J. H. B. Thwaites. A new or improved machine or apparatus for holding postage or receipt stamps, and applicable wholly or in part to other similar purposes.

3027. D. West. An improvement in presses constructed to operate by a combination of iron levers, which presses are employed to compress bales of cotton, hemp, wool, and other articles of merchandise.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

2996. Edward Joseph Hughes.
3000. Thomas Symes Prideaux.
3002. John Parkinson.
3020. Claude Alphonse Roux.
3026. Henri Catherine Camille de Ruolz and Anselme de Fontenay.
3028. Walter Mabon.

1854.

16. Thomas Mann.
33. John Healey.

LIST OF SEALED PATENTS.

Sealed December 30, 1856.

1537. Frederick George Sanders.
1538. Alfred Wild.
1539. John Coope Haddan.
1540. James Atkinson Longridge.
1545. George Tomlinson Bousfield.

1569. Edwin Greenslade Bradford.
1624. William Robertson.
1635. John Fowler, jun., and William Worby.
1665. John Henry Johnson.
1670. Henry Turner.
1677. John Henry Johnson.
1684. The Reverend George Jacque.
1755. Charles Burton.
1766. Edward Lord, Thomas Lord, Abraham Lord, and William Lord.
1768. Thomas Byford.
1769. Robert Stewart.
1794. William Edward Newton.
1818. Alexandre Tolhausen.
1943. John Henry Johnson.
1948. Jules Laleman.
2153. John Knowelden.
2168. Robert Mushet.
2170. Robert Mushet.
2329. Walmsley Preston.
2363. William Stettinius Clark.
2367. Charles Burton.
2402. Samuel Bremner.
2428. George Wilson.
2443. Leon Joseph Pomme de Mirimonde.
2455. Robert George Barrow.
2462. Henry Deacon.
2486. George Edward Johns.
2556. Charles Augustus Ferguson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

R. Armstrong.—Your letter reached us too late for insertion in this Number, but shall appear in our next.

The publication of several communications is unavoidably deferred.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

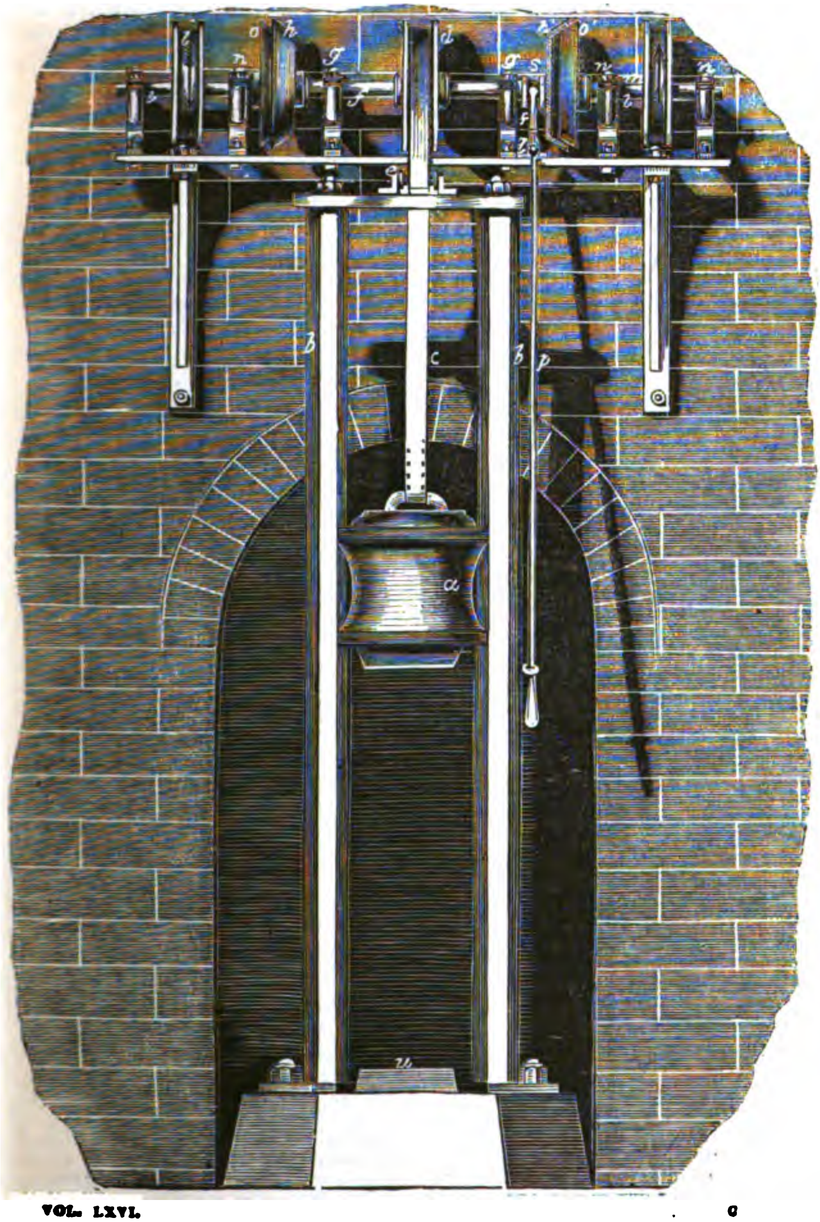
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1744.] SATURDAY, JANUARY 10, 1857. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

HUTTON'S PATENT POWER HAMMER.



HUTTON'S PATENT POWER HAMMER.

Mr. W. Carr Hutton, of Sheffield, has lately obtained a patent for "improvements in stamps or hammers worked by power," according to which improvements the stamp or hammer head is raised by means of a suitable band, strap, or chain, attached to a drum or pulley on an axis supported in suitable bearings, and whose ends are capable of being connected by a clutch box, with cones driven by bands or straps from a steam engine. The cones are caused to rotate in opposite directions, and the connecting means to the shaft are so arranged, that when one is connected, so as to move the shaft, the other is free of it. The connections may be effected by a forked lever. When the blow is struck by the stamp or hammer head, advantage is taken of the momentum given by the falling head or stamp to assist its elevation again. The stamp or head is guided by suitable guides.

The engraving on the preceding page represents an elevation (partly in section) of such a stamp or hammer. *a* is the stamp or hammer head; *b*, *b*, are guides by which the same is guided in its movement; *c* is a strap (or it may be a band or chain), one end of which is connected to the hammer head *a*, and the other to the drum *d*, in such manner that as the drum *d* rotates in one or other direction, it may, by winding up the strap *c*, raise the stamp or hammer head *a*; *e* is a roller to guide the strap *c*. The drum *d* is affixed upon a shaft or axis *f*, which is supported in bearings *g*, *g*, in which it is not only capable of a rotatory but also of an endway motion, in order that the hollow cones *h*, *h'*, affixed one at each end of the shaft or axis *f*, may be capable of being slided alternately upon one or other of the cones *o*, *o'*, affixed respectively to shafts *l* and *m*. These shafts are supported separately in bearings *n*, *n*, and they have upon them driving pullies (one *i* the other *k*), acted upon by straps or bands, by which they receive rotatory motion in opposite directions, as indicated by the arrows, from a steam engine. Thus it will be seen, that when, by the sliding of the shaft or axis *f* to the left, the hollow cone *h* is made to bear upon the solid surface of the cone *o*, a rotatory motion will be given to the shaft or axis *f* in the direction of that of the pulley *i*, and that when, by the sliding of the shaft or axis *f* in the opposite direction, the hollow cone *h'* is caused to bear upon the cone *o'*, the shaft or axis *f* will receive a rotatory motion in the direction of that of the pulley *k*. The sliding of the axis or shaft *f*, according to the arrangement shown, is effected by the lever *p*, which turns upon the fixed pin *q*, and at its upper end is formed into a fork *r* to embrace the collar *s*, as is well understood; but this may be varied.

In using the stamp, the workman by pushing the handle for example, to the left, causes the hollow cone *h'* to embrace, and by the friction of the surfaces to hold upon the cone *o'*, when the pulley *d* will receive a rotatory motion in the direction of the pulley *k* to lift the weight. When he has thereby raised the hammer head sufficiently high, the workman moves the lever handle a little to the right, sufficient to disengage the hollow cone *h'* from the cone *o'*, when the hammer *a* falls by its own weight upon the die *u*.

By the descent of the hammer *a*, a rotatory motion is imparted to the pulley *d*, in the direction of that of the pulley *i*, and the workman, by moving the handle still further to the right at the moment when the hammer *a* falls upon the die *u*, causes the hollow cone *h* to slide upon and engage with the cone *o*, when the band *c* will be coiled upon the pulley *d* in a direction contrary to that in which it was previously coiled, and the hammer will be again raised. When the hammer head *a* is again at the required height, the workman moves the handle to the left, and thereby first disengages the cone *h* from the cone *o* to admit of the fall of the hammer head, and then re-engages the cone *h'* with the cone *o'* and so on, the hammer *a* being raised by engaging alternately the shaft *f* into the shafts *l* and *m*, such shafts having, as already stated, motions given them in opposite directions. After the shaft *f* has been disengaged from either of the shafts *l* or *m*, the descent of the hammer gives to the pulley *d* momentum in a direction opposite to that of the shaft from which the shaft *f* has just been rotating, and in a direction similar to that of the shaft with which it is about to be engaged.

The patentee sometimes dispenses with one of the shafts *l* or *m*, together with the cones acting with it, and uses only one shaft with a cone, and capable of acting with a hollow cone on one end of the shaft *f*.

CLIFFORD'S METHOD OF LOWERING BOATS.

Another extraordinary and highly successful trial of Mr. Clifford's arrangement has been made on board H. M. steam store ship *Dee*. During a strong gale of wind, and while the ship was steaming at her full speed, her starboard cutter, which had been fitted with Clifford's apparatus, was manned with her full crew (nine men); and being instantly and safely unlashed, was lowered and entirely freed from the ship by one sailor only in the boat. "It is scarcely possible," says the *Times*, "to subject the plan to a more severe trial, from the severity of the gale which was blowing at the time, and which was expressly chosen. The result has been pronounced extremely satisfactory, not a single drop of water having entered the boat."

SHIPPING REGISTRATION.

Mr. Atherton having opened a discussion on the above subject in the *Times*, the Rev. J. Woolley, LL.D., has considered it necessary to express his dissent, as one of the members of the British Association Committee, from some of Mr. Atherton's views. We take the following remarks from Dr. Woolley's letter:

That for the scientific comparison of the locomotive merits of ships the light and load displacements are among the requisite data I readily admit, and I do not despair of seeing the day when the gentlemen who are interested in shipping will acknowledge the benefit arising from the publication of these data, and will voluntarily supply all the information that can be reasonably required for this purpose.

We know that the labours of the Tonnage Commission which sat in 1849 were rendered futile, because they adopted the load displacement as the basis of tonnage registration. The Government wisely adopted the only alternative which offered, and established by the law of 1854 the internal capacity as the measure of registered tonnage. Shipowners are still very sensitive with regard to a compulsory limit of load draught, which, I fear, they will be unable to separate from Mr. Atherton's propositions, and dread (with what amount of reason it is not my business here to decide) numberless annoyances and vexations which such a limit, if legalized, would produce. I think myself that the requirements of science may be realized without subjecting them to the reality or fear of these unpleasant consequences. I think, therefore, that there is no wisdom in frightening them out of their propriety, and raising, *in limine*, an opposition which will certainly defeat our common object.

All persons practically acquainted with shipping who have as yet spoken out on this subject, including another member of the committee (Mr. Scott Russell) who took part in the discussion on Mr. Atherton's paper, read before the Society of Arts last January, agree that the present mode of tonnage-admeasurement is, for fiscal purposes, as fair as any general mode of measurement can be fairly expected to be. Government, therefore, whose only object was to avoid injustice in the imposition of taxes on shipping, deserve great praise for the success which has confessedly crowned their efforts, rather than the blame which we hear sometimes unreasonably heaped upon them. The registered tonnage now, at all events, is in strict proportion to the internal cubature, and is independent of any peculiarity of form, and therefore embraces the chief condition for the equitable assessment of tolls.

Mr. Atherton immensely overstates his case—and runs the risk of incurring the usual penalty for so doing—in his remarks on the facility of evading the present law. In the first place, I do not believe it is worth any one's while to attempt an evasion, so far as such an attempt depends on the form of a ship. Again, that a vessel of 100 registered tons would, as a general rule, be quite capable of carrying 100 tons weight of cargo will not be disputed; but I think most practical men will scarcely credit their eyes when they read Mr. Atherton's announcement, that "a ship of 1,000 tons registered tonnage may be so proportioned and built as to be too deeply immersed for sea even at her launching draught." One cannot see what a shipbuilder can propose to himself to gain by building such a vessel; the gain would be all on the side of Government, as the levier of tolls. Mr. Atherton's imagination may be vivid enough to conceive a vessel of 100,000 cubic feet internal measurement being too deeply immersed at the launching draught; I confess that mine is not. The only case that occurs to me as possible is when the stability is insufficient; and neither external nor internal measurement will remedy that. The greater part of ships which are unstable at the launching draught, such as the *Perseverance*, are so because they are not sufficiently loaded, and want their weights lower. At any rate, it is a fallacy to adduce such an example as an illustration of the relative merits of measurement by displacement and internal capacity.

It may safely be assumed that for the given weight and cost of a ship the owner would be glad of the largest possible amount of internal capacity. When for the sake of strength a vessel is built on a particular (such as the cellular) principle, which increases the average difference between external and internal capacity, the owner, who looks for remuneration to a general cargo, and not the heaviest materials which are the objects of commerce, lies under a positive disadvantage, and would, I think, be treated very hardly if, in addition to the increased prime cost of his vessel, he were charged for capacity of weight which is of no value to him, a good part of which he is obliged to make up by ballast. For this reason I think, for fiscal purposes, the present admeasurement for tonnage fairer than that of the load displacement would be.

With regard to what is meant by tonnage,

there need be no delusion. The old builders' measurement is sometimes still employed; but a buyer or seller of ships who can be deluded by any uncertainty in the term "tonnage," is not fit to be employed in such a trade, and deserves no more protection from Parliament than the simpleton in any other trade who chooses to buy "a pig in a poke."

For my part, I am quite content with the law as it now stands for all the purposes for which it is intended. Whatever more is required for scientific purposes, let us ask for it as something over and above, and not get our request rejected before it is prefered by exciting the apprehensions of the shipping interests.

ARMSTRONG'S IMPROVED ORDNANCE.

Mr. W. G. Armstrong, of the Elswick Engine Works, Newcastle-upon-Tyne, whose engineering talents are well known, in the latter part of 1854 submitted to the Minister at War a proposal for a gun which he anticipated would possess great superiority over the common forms of light artillery, and undertook to construct a field-piece in conformity with the plan suggested. This gun has, during nearly two years, been the subject of numerous experiments, partly at Shoeburyness, but principally under Mr. Armstrong's own direction in the North. The following account is prepared from the published statements of the inventor.

The gun is composed internally of steel and externally of iron, applied in a twisted or spiral form, as in a musket or fowling-piece. The bore is nearly 2 ins. in diam. and is rifled. The projectile is a pointed cylinder 6½ ins. long, weighing 5 lbs., of cast iron, coated with lead, and is fired with a charge of 10 ozs. of powder; it has a small cavity in the centre, and may be used either as a shot or a shell. When applied as a shell the cavity is filled with powder, and a detonating fuze is inserted in front, so as to fire the powder in the centre on striking an object. When used as a shot the powder is omitted, and an iron point, which favours penetration, is substituted for the fuse. The gun loads at the breech, not only to obviate the sponging and loading from the front, but also to allow the projectile to be larger in diameter than would enter at the muzzle, and thus to insure its taking the grooves and completely filling the bore. The piece weighs 5 cwt., and is mounted upon a carriage which resembles that of an ordinary 6-pounder field gun, but which embraces a pivot frame and recoil slide. A screw is applied, not only for elevating and depressing the gun, but also for moving it horizontally, by which means great delicacy of aim is effected. The recoil slide inclines upward, which enables the gun after running back to recover its position by gravity; its use is to relieve the pivot frame and adjusting screws from injurious concussion.

The following are some particulars of experiments recently made with this gun on the coast of Northumberland, near the village of Whitley, under the official inspection of Colonel Wilmot.

Fourteen shots were first fired 1,500 yards at a timber butt, 5 ft. wide and 7½ ft. high. Six were expended in finding the proper elevation, but every succeeding shot hit the object without previous graze. The final elevation of the gun was 4 deg. 26 min., and the mean lateral distance of the shot marks from a vertical line through the centre of the butt was only 11½ in.

"The ordinary 6-pounder field piece," says Mr. Armstrong, "which in point of weight forms the nearest approach to the present gun, is perfectly useless at a distance of 1,500 yards, and is very uncertain even at 1,000 yards. It is only, therefore, with heavy artillery that a comparison can be drawn, and it will be sufficient to state that in tabulating the practice made with such ordnance the deflections are invariably recorded in yards, whereas with this rifled gun they can only be properly given in inches."

With respect to penetration, the following particulars are remarkable. The butt was 3 ft. thick, composed of six layers of rock elm bolted together, so as to form a solid block. One shot passed entirely through; another struck near the edge and glanced; and the remaining six passed nearly through.

Shell firing was next tried at 1,500 yards, at the same elevation and with the same charge as before. Two targets were erected, one behind the other (so as to appear as one when viewed from the gun) with a space of 30 feet between them. The front target was to exhibit the perforations of the shells before bursting, and the back one the effect of the fragments resulting from explosion.

Twenty-two shells were fired at the front target, and of these only one missed the object of aim; seventeen hit the first target direct, and burst behind it, the fragments penetrating the second; three grazed and burst immediately in front of the first target, and perforated both with the pieces; one hit the bottom of the first target and exploded in the ground; and the remaining one missed entirely. "A strong side wind was blowing at the time," says Mr. Armstrong, "and accounted for the deviation of this single shell."

Four shells and three shot were then fired at an elevation of 6 degs., from a distance of 2,000, or, more accurately, 1,964 yards. All these struck within the breadth of the target, but, the elevation being scarcely sufficient, fell a little short.

The results of this shell firing were as follows:—The front target contained 51 holes, and the back one 164, while the ground between and adjacent to the targets exhibited about 70 perforations by fragments of shells.

On previous occasions the gun had been tried up to 3,000 yards, which was reached with an elevation of 11 degs., and the usual charge of 10 oz. of powder, or one-eighth the weight of the projectile. By augmenting the charge the range is increased, but the accuracy is impaired. Mr. Armstrong observes that "the ranges obtained with this charge (10 oz.) bear a favourable comparison with those of the heaviest round shot guns fired with a much larger proportion of powder."

It is a curious fact, and one which greatly increases the efficiency of the shells, that owing to the bursting charge requiring a short space of time to mature its ignition after the firing of the fuse by impact, the shell is enabled to travel four or five feet after striking an object before disruption takes place. Hence, it acts as a shot before it bursts as a shell. If, therefore, it were fired against a ship, it would first penetrate the side, and then, bursting, traverse the deck in fragments; or if directed against troops, it would pierce the front line as a bullet, and operate like grape shot beyond. The shells are said to explode with certainty whether the substance struck be hard or soft, and even burst on the surface of water, provided the elevation be not too great.

In the course of the long series of experiments made with this gun it has been fired nearly 1,300 times without sustaining any permanent injury either in the breech loading arrangement or otherwise. The only parts exposed to wear are separable from the gun, and can with great facility be renewed.

EXPANDING RIFLE BULLETS.

Lord Panmure, being desirous of rewarding the ingenuity displayed in the first suggestion of the principle of expansion, as applied to bullets, has, with the concurrence of the Lords Commissioners of her Majesty's Treasury, sanctioned the submission to Parliament of an award of 1,000*l.* to Mr. N. Greener, of Birmingham, in the army estimates of 1857-8, as a public recognition of his priority in bringing this invention before the War Department.

Extract from a Report of the Ordnance Select Committee on Mr. Greener's claim to the invention of the Minié bullet, dated 28*th Aug. and* 4*th Sep.*, 1856.

The committee, having attentively considered the whole of the correspondence, and discussed the different points connected with this subject at their meetings on the 28th of August and the 4th of September, have agreed on the following report:

"The records of the committee furnish no information as to the shape of the bullet used in the experiments carried on at Newcastle in the year 1836. Mr. Greener states that it was an oval-shaped bullet, but, whether oval or spherical, it appears, as far as the committee can judge from their record, that Mr. Greener was the first to propose and anticipate the principle of expanding the ball, which since has been so successfully applied.

"It does appear that in 1836, or again in 1842 (when Mr. Greener was before the committee), that the committee were made fully acquainted with the form of projectile proposed or the principle involved; but Mr. Greener has referred to a letter written by him to the *Times* newspaper, December 25, 1841 (copy enclosed), which bears ample evidence of his having, at all events, at that time been quite aware of the principle now in general use; and if any reward is considered due for the contribution to a discovery without bringing it to a practical result, the committee consider Mr. Greener entitled to a reward."

POSTAL ARRANGEMENTS.

The Postmaster-General, anxious to promote rapidity and correctness in the delivery of letters, has, for postal purposes, divided London and its environs into ten districts, each to be treated, in many respects, as a separate town; and, to render this arrangement effectual, he earnestly requests that every means may be taken by the public for causing letters to be directed *according to the district for which they are intended.* Initials will suffice.

The Office of the *Mechanics' Magazine* being situate in the East Central district, all letters should be addressed thus:—

The Editor of the Mechanics' Magazine,
166, *Fleet-street,*
E. C.

or, when from the country, thus:—

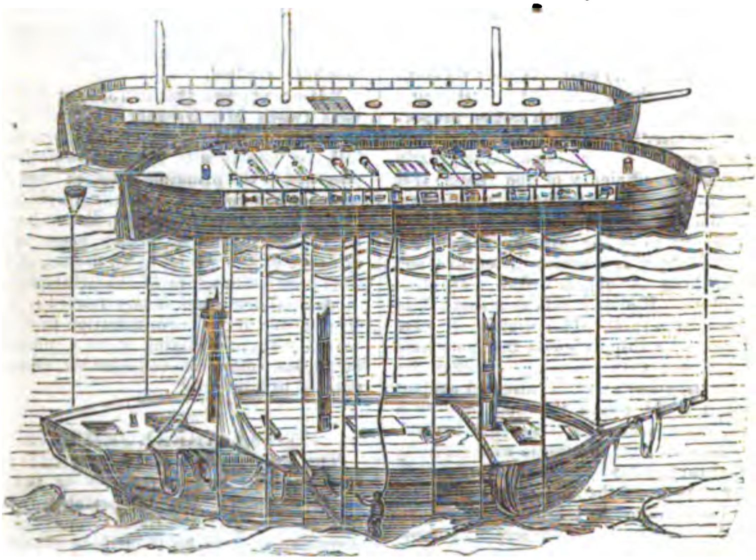
The Editor of the Mechanics' Magazine,
166, *Fleet-street,*
London,
E. C.

The Postmaster-General suggests, as other means of inducing this practice, that, when convenient, each resident in a district should add the name of the district, or the initials, to his own address inside his letters when writing to correspondents, and on his address card. Also, that if in business, he should give the name of the district, or the initials, in the heading of bills or invoices, in advertisements or placards, and on any article of manufacture which may bear his address.

If the initial letters be thus regularly appended, the Department will be able to assort, with facility and correctness, the country letters, according to their respective districts, before they reach London in the morning.

RAISING SUNKEN VESSELS.

A company has been incorporated under the Joint Stock Companies' Act, 1856, with limited liability, for raising sunken vessels and their cargoes, and other submerged property. The recovery of these has hitherto been attempted in detail by dangerous processes, involving a considerable expenditure of labour and capital, which, in most



instances, have been productive of very inadequate results. It is now proposed to apply efficient means for the recovery of all such property, by the adoption and use of S. R. Smith's ship lifting apparatus, patented 5th April, 1854, and briefly described at page 427 of our sixty-first volume.

The amount of property annually lost around the coasts of the United Kingdom is shown by the Report of the Surveyor-General to the Board of Trade of the Wrecks and Casualties for the year 1855. The number of vessels is 1,141; of these 385 are sunken (there being no existing means in use for raising them); the remainder stranded and partially recovered by inadequate means, which the plan of the company proposes to supersede. We need scarcely say, that the object of the company is a very laudable one.

The apparatus to be employed consists of two floating vessels of large capacity, each somewhat resembling the hull of a ship, having a deck, on which the principal mechanical operations are performed, and furnished with a series of iron tubes arranged in the central line of the deck, and passing through the body of the vessels from the deck to the bottom, the said tubes being used as conductors, through which chains are worked for the purpose of lifting sunken vessels or other ponderous bodies; (or these vessels may also be used for depositing heavy masses of concrete or masonry to be used in the construction of piers, harbours, breakwaters, &c.) The tubes being in the centre of the vessel, admit of the use of any available power for lifting or otherwise, without lurching or disturbing the vertical position of the vessel and apparatus; it also admits of the use of encircling chains to be applied for lifting vessels or other bodies.

The accompanying engraving illustrates the general features of the invention. Separating shores are used to keep the two vessels apart, in order to allow the wreck to be brought up between them. The encircling chains are carried by a tug boat, fitted on purpose to work those chains round the wreck, divers pinning and shackling the chains below water. The wreck, when raised to a sufficient elevation and secured by chains passed under it, is then bodily carried away by aid of the propelling power of a screw attached to each lifting vessel.

OUR GUN-BOAT AND MORTAR-BOAT FLOTILLA.

The article on the above subject in our last Number requires a slight correction or two.

It appears that the *Gnat* was but partially hauled up on the 25th of November last, in consequence of part of the machinery breaking down, and that she was not completely stowed until last week, the intervening time having been occupied in restoring and perfecting the machinery. The operation last week was attended with complete success.

It should also be stated that the slip with the vessel upon it is hauled up the main slip-way, not by tackles, but by a single direct chain from a fixed engine.

SCREW COLLIERS.

Arrangements are being made on the Tyne to introduce a class of vessels into the coal trade, which, if the experiment prove successful, must materially affect the fortunes of this branch of our mercantile marine. The present class of screw colliers carry from five to six hundred tons; but Mr. Hugh Taylor, the chairman of the London Coal Exchange, and other gentlemen engaged in similar operations, have determined to build a fleet of vessels to be employed in this trade, capable of doing more than double the duty performed by the moderately-sized vessels now in use; and from the standing of the parties and their great experience in this trade, there is just reason for believing that the movement is in the right direction.

DEATH OF DR. URE.

It is with deep regret that we announce the death of Dr. Andrew Ure, whose name and works are known and highly esteemed throughout the scientific world. For the present we will merely supplement this painful announcement with the following brief notice of his life and scientific labours:

He was born in Glasgow on the 18th of May, 1778, and studied at the universities of Glasgow and Edinburgh. In 1806 he was appointed, on the resignation of Dr. Birkbeck, Andersonian Professor of Chemistry and Natural Philosophy. He was at this time engaged in the establishment of the Glasgow Observatory, where he resided for some time, and was visited by the celebrated Sir W. Herschel. He was eloquent as a lecturer, and most successful in his class experiments. In the year 1818 he brought forward his "New Experimental Researches on some of the leading doctrines of Caloric, particularly on the relation between the elasticity, temperature, and latent heat of different vapours, and on thermometric admeasurement and capacity," which was read before the Royal Society, and published in their "Transactions" for that year. Mr. Ivory, Mr. Daniell, and other philosophers have adopted the conclusions offered in this paper as the bases of their meteorological theories. In 1821 appeared the first edition of his well-known "Dictionary of Chemistry," which procured him the friendship of Sir H. Davy, Dr. Wollaston, and Dr. E. D. Clarke. In 1822 appeared his paper "On the Ultimate Analysis of Vegetable Substances" in the "Philosophical Transactions." In the year 1829 his "System of Geology" was published. In 1835 his "Philosophy of Manufactures" followed, and in the following year his work on the "Cotton Manufactures of Great Britain," in two volumes. It was the remark of an eminent machine maker and engineer, that from the minute accuracy of the descriptions and engravings in this work, the actual machines might be manufactured without difficulty. His next great work was the "Dictionary of Arts, Manufactures, and Mines" a work of immense labour and research, the last edition of which appeared in the year 1852. This work has been translated into the leading continental languages. Distinguished as a sound chemical philosopher, he was no less remarkable for accuracy in chemical analysis. It has been asserted, indeed, by competent authority, that none of his results have ever been upset. He became a Fellow of the Royal Society in 1822. He was one of the original Fellows of the Geological Society. He also belonged to the Astronomical Society, and was a member of several scientific continental societies.

THE BELL AND CLOCK FOR THE HOUSES OF PARLIAMENT.

The discussion upon the bell and clock for the Houses of Parliament is continued by Mr. Denison in the following letter, written in reply to Mr. Loseby's, which was published in No. 1741 of this Magazine, for December 20, 1856, p. 584.

Sir,—Mr. Loseby may depend upon it that he will find some little regard to truth expedient in the long run, even if he gets people to believe him for a week without it. In justification of his foolish and malicious charge, that I designed the Westminster clock for a hammer of only 120 lbs., he now goes back to a table of sizes of bells and hammers furnished to the Astronomer Royal, by the late Mr. Dent, in 1846, with which I had no more to do than Mr. Loseby himself. And of this table he knows the following things as well as I do:—

1. The hammer there set down with 120 lbs. opposite to it, is not a hammer of that weight, but is a reduced weight of a heavier hammer, for the axle of 35 deg.

2. It was expressly stated there to be proposed as the hammer for a bell, not of 14 tons, like Mr. Vulliamy's 150 lbs. hammer, but for a bell like the Oxford one, which is the worst large bell in England, and therefore has a much lighter hammer.

3. That plan never was adopted by any contract whatever.

4. It was proposed six years before I was consulted about the clock.

5. As soon as I was consulted I prepared a new plan, with the concurrence of the Astronomer Royal, which the company of clockmakers themselves described as so different from Mr. Dent's former plan, that it ought to have been, in their opinion, thrown open to a fresh competition.

He says that my statement, that I contemplated a hammer of nearly eight times the power represented by him, is not confirmed by the Parliamentary Papers. He knows perfectly well that that was not the place to which I referred him to find it; but to the Encyclopædia Britannica Treatise on Clockmaking, written by me in 1854, and sold by Mr. Dent. Nothing at all appears about it in the Parliamentary Papers, because that and all other details were left to the judgment of Mr. Airy and myself by the contract.

He says that Mr. Vulliamy's plan, adopted by the company of clockmakers, was stronger than mine, because the great wheel of their striking part was 3½ feet, whereas mine is only 3 feet. But he knows that in that plan the great wheel was not the striking wheel; and he ought to know that that was one of the most glaring defects of that most defective plan. It was actually intended to raise the hammer for a 14-ton bell by pins set in the second wheel of the train, acting on a lever consisting of a half-inch round rod, where mine is 2 ins. square in section.

His rage against cast iron wheels is only the old Clerkenwell clockmakers' prejudice, with which they have steadily resisted every improvement in clockmaking, and I shall not enter into that here. When any of them can make a turret clock on their plan, equal in performance to Mr. Dent's cast iron ones, it will be time enough to discuss it.

Mr. Loseby has really outdone himself in his desire to give a finishing stroke to my plan, by saying that the Government is to pay Mr. Dent for executing it as much as they would have paid Mr. Vulliamy, if they had adopted his. Even if that were so, I do not see what the Government, or the public, would have to complain of, since Mr. Vulliamy's clock (as the Astronomer Royal reported) was nothing better, in point of accuracy, than "a large village clock," and it was totally unfit for its work besides. But the fact is, as Mr. Loseby again very well knows, Mr. Dent's contract is for £1,900: and Mr. Vulliamy's estimate (which he never would give until he knew it could not be accepted) was £3,500.

This is a pretty fair amount of "fabrication" for one letter, I think.

If Mr. Loseby prefers bad bells, like the Oxford one, and most of the large English bells, which will only bear a clapper of $\frac{1}{100}$th of their weight, or less, to good ones, like the Westminster bell and some of the great continental bells, with clappers two or three times as heavy, that is a matter of taste, on which he must have his own way. I wish the Clockmakers' Company and the opposition bell-founders joy of their advocate's taste, as well as his veracity.

I am, Sir, yours, &c.,
E. B. Denison.

HAULING-UP SLIPS FOR TRANSPORTING SHIPS.

To the Editor of the Mechanics' Magazine.

Sir,—I have just seen in your Magazine of last week a description and illustration of White's "Hauling-up Slips" as constructed at Portsmouth for laying up the gun and mortar vessels out of commission.

As long ago as 1847, I designed a slip of nearly the same construction, in connection with a section of railway which I proposed to apply to the Isthmus of Suez, on the line of the ancient canal, for the purpose of transporting vessels overland from the Mediterranean to the Red Sea, and *vice versâ*. Without for a moment pretending to dispute with Mr. White the originality of his plan in its present form, I am anxious to lay before your scientific readers the plan I proposed, with a view to elicit an opinion as to its feasibility. My design was to construct a slip running out into the sea at an easy slope (or rather perhaps a convex curve), to a depth of not more than 15 feet. As that depth would be insufficient to enable large vessels to be brought directly on to the slip, I proposed to use large camels, of a construction which I will describe hereafter, but similar in principle to those used in the Neva for floating down large vessels from St. Petersburg to Cronstadt. These were to be towed out into deep water by a small steamer, to receive the vessel, and would be sufficiently large when empty to reduce the vessel's draught of water sufficiently to admit of its being brought on the cradle of the slip, *with the camels still supporting her*. A stationary engine (or, as has since been proposed, hydraulic power,) would then be applied to haul her up the incline, and she would be transported to the

opposite shore of the Isthmus by as many locomotives as there were lines of rail employed in supporting her, and there launched again into her proper element, by a process the reverse of that already described.

The "camels" were somewhat peculiar in form; they were to consist of two long hollow prisms of stout sheet iron, strengthened interiorly by strong wooden triangular frames, and divided into watertight compartments. On the upper surface of each of these prisms, as they floated in the water, were several air-tight cushions or bags, made of four or five thicknesses of stout leather or air-proof canvas, extending the whole length of the prisms in longitudinal compartments, or divided transversely, as might be preferred, and forming, when inflated, an elastic bed to receive and adapt itself to the lines of the ship. These camels would be brought alongside the vessel, and sunk, by admitting water into them, till they were well under her. They would then be connected together by rods and screws, and then pumped out again. As the vessel rose, the cushions would be inflated to receive her, and, by distributing her weight over the whole surface of the pontoons, would prevent any strain from unequal support. The railway would consist of from five to nine lines of parallel rails of sufficient gauge and calibre to distribute and support the vessel's weight on as large a base as practicable, consistent with the condition of locomotion.

Such were the general features of the plan, as it was roughly sketched out on paper; but I was at that time in the north-west of India, without a book almost to refer to for information as to even the smallest details of the means or material it would require. And therefore, after showing it to one or two friends, who ridiculed it as visionary, I threw it aside with something of the same opinion.

The world has, however, grown older since then; and I have seen, and hope to see many more (apparently) visionary things, brought into practice; and the perusal of your last week's Magazine reminded me of some parts of my plan, and have induced me to resuscitate it.

I may, in conclusion, add, that it would obviate what I conceive to be the two great difficulties of the proposed canal—namely, the shallow approaches to its entrances in each sea, and the scarcity of the water supply to maintain a sufficient depth in the higher levels of the canal itself. Admitting, however, that a canal would be preferable, the "camels" might be a valuable adjunct in bringing vessels to its entrance, and, by giving greater buoyancy with a less draught of water, would carry vessels through the canal which otherwise would not admit them.

I am, Sir, yours, &c.,

JOHN BAILLIE,
E. I. C. S.

14, St. James's-square, Jan. 5, 1857.

RIFLED ORDNANCE.

To the Editor of the Mechanics' Magazine.

SIR,—I have read with much interest a "Treatise on Rifled Ordnance," by "*Dunamikos*," noticed in your Magazine, a week or two since, and consider it is very creditable and enterprising in an individual to undertake experiments in gunnery, involving, as they do, a large expense, and the expenditure of a great deal of time, before results of any value can be attained. Should his rule for giving the twist to rifle grooves be found even to approximate the truth, he will be entitled to great credit; for its application to small arms has baffled theorists with all their labours of the last five years; and the experiments of the French Government, in lieu of settling the question, have shown it to be most difficult of solution, *quoad* hand-arms at least. I submit a few suggestions which, if of no practical value to the nation at present, may, through the effective aid of "*Dunamikos*," be developed and proved, or disproved.

Having superintended the erection of steam machinery for producing the rifle used with the hollow elongated ball, and a series of experiments on the form of projectiles; and having had my attention turned, during a number of years, to all the modern improvements, made and attempted, having reference to rifled arms and ordnance, I am led to the conclusion that where range and accuracy are desirable, the rifled cannon will eventually, and at no distant date, supersede the use of the smooth bored gun, both for field service and in batteries, and is therefore worthy the attention of artillerists, both theoretical and practical—the suggestions of the one being verified or condemned by the experiments of the other.

The elongated projectile first suggested by Hutton as a *desideratum*, has but recently attracted the attention of scientific men, although long in use by the Swiss, and in the United States, and it has been subjected to various modifications of form, in the hands of De Lavigne, Minié, Pritchett, Greener, and others. By comparison of these balls and their appropriate rifles with the Swiss, I was satisfied that, at and under 800 yards, the latter had the advantage in accuracy, and required less elevation. The objection to it, however, was the

difficulty of loading, as the ball required driving down; and after a few discharges the difficulty increases, as in the rifle in ordinary use. I found, however, that by diminishing the calibre and increasing the length of the ball, that the ball, although as loose as the Pritchett and without any hollow in the rear, took the grooves perfectly, and from being enabled to use a greater charge of powder, and the ball offering less resistance than one of larger calibre and equal weight, the twist required was larger, thus avoiding, in a great measure, the spiral or cork-screw motion, known by the French as *derivation*, to distinguish it from the motion on its axis called rotation. (This motion is exhibited in the humming top after it leaves the handle and before it *sleeps* on its centre, and will serve to explain many puzzles in the flight, velocity, and direction of oblong projectiles.) The curve of flight was parabolic, and a much less accurate knowledge of distance would suffice to ensure its hitting such objects as men, cavalry, &c. The fact is, that the first impact of the gases from the ignited charge, *upsets* the lead at the rear of the ball, before the inertia of the forward end is overcome, and it is forced into the grooves. By diminishing the calibre and increasing the length of the projectiles, I found that larger charges of powder were of course required, but the ball was of simpler construction than the Minié ball; it offered less resistance to the air, its flight more nearly resembled that of the arrow, its initial and mean velocities were greater, and its ricochet more serviceable. By cutting channels around its periphery, the swedging or upsetting can be carried well forward in the substance of the ball, and the ball leaves the muzzle of the rifle a perfectly compact mass, showing only the grooves, the channels being obliterated. It may be objected that this ball would not make so bad a wound as the minié ball. It is true, that it would be more like a punctured wound, but it would go through two instead of one, and when it met with a positive check, such as a large bone would offer, it would turn over and do equal mischief.

The Prussian needle gun was found to have some advantage over other arms of the same calibre, from igniting the powder in front, but this was not considered sufficient to compensate for the disadvantage of carrying fixed ammunition containing fulminate, and the liability of the needle to get out of order. Again, as length of needle was a strong objection, the calibre of needle guns was large, and it could not have the same proportionate advantage as in a smaller bore. But I claim it to be correct in principle, and to be attainable in a more simple manner.

The Government of the United States made experiments with rifled cannon and oblong balls, a few years since, which were totally unsuccessful. Since that time, however, practical men in that country have constructed rifled ordnance, and have lately succeeded in obtaining unparalleled ranges in their experiments with guns loading at the breech. I have witnessed some of these experiments, and have seen their guns and projectiles. One of these guns, constructed at the Novelty Works, New York, was over 20 feet long, 12 or 14 inches diameter at the breech, and its bore of about the calibre of a 6-pounder. It was made in two pieces, bolted together by flanges in its centre, for convenience of boring and carriage. The projectile used was about five calibres in length, conical at both ends, made of iron, and surrounded by a leaden ring, of one-fourth of its length, cast around its centre, and cast with furrows and bands fitting to those of the bore, and at the same angle of twist. The shot and service charge were inserted at the breech, which was closed in their rear by a tapered key, driven down from above with a mallet, through slots in the body of the gun, and having a projecting head extending backwards. The key is raised by means of a short curved crowbar, when a fresh charge is to be introduced. Forward of the breech charge (which is comparatively light) and the shot, are four chambers screwed into it, called by the inventors *accelerators*. They enter the barrel or bore at an angle of perhaps 45° to its line of metal. These chambers are loaded separately, with a small wad of gun-cotton and charge of powder, and closed by keys similar to the one already described. They are placed two on each side, one pair a few inches in advance of the ball, the second pair perhaps a foot or more in advance of the first pair. The first charge, on ignition, overcomes the inertia of the projectile, and its flame ignites the four anterior charges as the ball passes out. The report is a single one, and the initial velocity, penetration, and point-blank range obtained by these somewhat complicated appliances, both on the small and large scale, are incredible. With the gun just described, in the first experiments they obtained a range of nearly 5,000 yards, and expected a greater range with increased charges; and I have seen a small ball of about $\frac{40}{100}$ths of an inch in calibre driven (by 3 drachms of powder arranged in like manner) from a rifle barrel, through 36 inches of board and 8 inches of brick wall behind it.

From the results before stated, and many others which it is needless to recapitulate, I

am led to believe that important results may be attained from rifled cannon, and that the present system of igniting the charge is incorrect in principle. The method described is defective on account of its complication of parts, the imperfection and weakness of a breech formed by the key and slot, and the difficulty which would occur in removing the keys after a number of discharges. I believe, however, that a gun loading at the muzzle may be constructed in a much simpler manner to attain the same object, by making it of comparatively great length and small calibre, and igniting the charge of powder at its forward end nearest the shot, either by placing the vent in that position, or by inserting wires into the body of the gun, and using the electric spark, when the use of that means is rendered certain.

Should your space permit, I will, in my next suggest a mode of constructing wrought-iron rifled cannon and their projectiles, which, I think, will be found simple in character, and worthy a trial by those who can afford to indulge in these experiments.

I am, Sir, yours, &c.,
W. M. B. Hartley.

16, Bury-street.

BOURNE'S "TREATISE ON THE STEAM ENGINE."

To the Editor of the Mechanics' Magazine.

Sir,—I should not have judged it necessary to make any remark upon your review of my work upon "Boiler Engineering," but for the occurrence of a mis-statement in it, which concerns a matter of fact. A reviewer, I take it, has the right to express his opinions as fully and freely as he thinks proper, upon any work submitted to his consideration, and if you should arrive at the conclusion that my work is worthless, I can have no objection that you should rest in that conviction. But no one has the right, and no respectable journal can have the disposition, to set erroneous statements before its readers, in the place of truths; and if such erroneous statements should have been accidentally made, the opportunity ought to be afforded for their prompt rectification. Believing that you will concur in the justice of this doctrine, I request that you will be good enough to give this letter insertion in your next number—its design being to point out the error to which I refer.

Some years ago, upon Professor Hann undertaking to edit a new edition of "Tredgold on the Steam Engine"—a duty afterwards confided to me—he found that in the "Artizan Club's Treatise on the Steam Engine," edited by Mr. Bourne, there were a number of plagiarisms from Tredgold's work. Mr. Weale, the proprietor of Tredgold's work, thereupon applied to Messrs. Longman, the proprietors of the work edited by Mr. Bourne, for some compensation for these plagiarisms, on the ground of the value of the matter thus abstracted. This compensation he received, and not content with this recompense for the alleged injury, he printed in parallel columns the original and the pirated passages, and circulated this proof of the plagiarism with the numbers of the work of Tredgold, then being re-issued. All this being true—though not the whole truth—I should not have thought it necessary to offer any remarks upon it, had you rested content with such a statement. But you go on to say, that the Artizan work, "bearing Mr. Bourne's name, was naturally thought to be Mr. Bourne's production," and, on the strength of this assumption, you proceed to expose the plagiarisms referred to, as if they had been committed by Mr. Bourne himself, instead of being the work of some other contributor to the "Artizan Treatise." Having cited the plagiarisms at some length, you add, "our readers will now entertain a more just estimate than heretofore of Mr. Bourne's authority"—thus connecting Mr. Bourne with these plagiarisms, as if he had been personally guilty of them.

Now, any one who will take the trouble of turning to the first edition of the "Artizan Treatise," will find that, so far is it from being the fact that the work with all its plagiarisms and imperfections "was naturally thought to be Mr. Bourne's production," Mr. Bourne, on the contrary, distinctly states, in the preface, that the work was only in part his production, and he states, moreover, what the parts of the work were which had been written by him. His words are, "*I have been obliged to confide the greater portion of the theoretical part of the present work to some mathematical assistants, whose algebra sometimes rises to a needless luxuriance, and in whose superfine speculations the engineer may, perhaps, discern the hand of a Tyro.* * * * *The preliminary and practical portions of the work have, for the most part, been executed by me. In the practical part of the work I have been able to obtain but little assistance from previous authors, and many of the subjects discussed are now brought for the first time before the public. Mr. Farey's work, though of great merit, gives but little information of any kind, touching modern engines, and Tredgold's work is chiefly made up of mathematical sublimities which have but little relation to practice.*"

This preface was written in 1846, several years before the plagiarisms from Tredgold were discovered.

Now, I confess myself wholly at a loss to imagine in what way Tredgold's work can be raised in general estimation, by the announcement that the "superfine speculations" of the "Artizan Treatise," "in which the engineer may, perhaps, discern the hand of a Tyro," and for the presence of which, Mr. Bourne thought it necessary to apologize to his readers, are, in point of fact, taken from Tredgold's work, of which they constituted the main staple and characteristic. The discovery, indeed, shows that the "mathematical assistants," of whose needless luxuriance of algebra Mr. Bourne complains, were as deficient in originality as in other useful qualifications, and that Mr. Bourne could not have been a very diligent reader of Tredgold, else the plagiarisms would, no doubt, have been detected by him. But it shows also, to demonstration, that the matter abstracted from Tredgold, and which was esteemed by Mr. Weale so valuable as to require compensation, had been previously considered, by Mr. Bourne, so worthless as to require an apology for its introduction having been permitted. Mr. Bourne, probably, would have refrained from condemning so strongly the imperfections of the theoretical part of the Artizan work, had he been aware that it was *Tredgold he was condemning*, but having given this opinion, under the impression that it was the work edited by himself he was criticising, he, of course, cannot now withdraw it. However, adverse opinions, in whatever quarter propounded, influence little the acceptation of a work on practical engineering. If engineers find that it possesses information useful to them they will possess themselves of it, and whether it does so or not they can tell far better than any reviewer. The practical part of the "Artizan Treatise"—which was the part Mr. Bourne contributed—is the part on which its reputation and popularity exclusively rest; and I do not believe you can produce a single passage in the whole of this portion of his work that is copied, either in its language or information, from previous authors. That its originality is as remarkable as its utility is known to every competent engineer; and it is absurd to suppose that it could have supplanted Tredgold, had it been a mere plagiarism or imitation of his work. Whatever blame is imputable to Mr. Bourne, as an editor, for having suffered any contributor to palm off upon him portions of the genuine Tredgold for original composition, he must be content to bear. That he was quite sensible of the inferior quality of the commodity, his preface shows plainly enough, and it shows also that he only accepted it from his inability to give this part of the work his personal attention; but he adds, that, "should a new edition be called for, I hope to clear the work of the dross, by which it is at present disfigured, and present it in a form that will in some measure justify the public approbation." This task, I believe, Mr. Bourne is now engaged in—not, however, at the second edition, but at the *fifth*.

I am, Sir, yours, &c.,
ROBERT ARMSTRONG.

65, Fenchurch-street, London,
December 30, 1856.

[Mr. Armstrong is perfectly correct in believing that we have not the smallest desire to give erroneous statements the place of facts in our pages. Indeed, the insertion of the above letter will show, we trust, that we are anxious to avoid even the very appearance of error, particularly in dealing with personal matters.

The style of Mr. Armstrong's letter contrasts strangely, and very favourably, with that of his book, and the representations contained in it shall therefore be considered.

In the first place, Mr. Armstrong's statement respecting the extensive plagiarism from Tredgold, accords perfectly with what we said, and the only objection we have to bring to that statement is, that by using the terms "alleged injury," and "not content with this recompense," he seems desirous of reflecting upon Mr. Weale for the part he took in the matter; whereas it is apparent, from his own remarks, that the injury sustained by Mr. Weale was real, and it is evident that no compensation for "the value of the matter" filched from Tredgold, could deprive Mr. Weale of the right to make the plagiarisms known to the readers of Tredgold.

The principal allegation of Mr. Armstrong is, however, that we were in error when we said of the Artizan Club Treatise on the Steam Engine, that, "bearing Mr. Bourne's name, it was naturally thought to be Mr. Bourne's production." Now, there is a sense, and, we admit, a very common sense, in which the word "production" would here be inapplicable; but what we intended by it was, not that Mr. Bourne had written every chapter in the book, but that he had *edited* the work, and was responsible for its contents. And if this be not the case, who was, or is, responsible? Mr. Bourne does, it is true, complain of the algebraical "luxuriance" and "superfine speculations;" but his very complaint indicates that he had carefully read the book through—as, in editing it, he was in duty bound to do. Reminding them of this then, and further reminding them that our object was "to make known what kind of an *authority* Mr. Bourne is," we ask our readers whether the case differs materially from our first repre-

sentation of it? It will be remembered that we made no deductions from the plagiarisms save the single one that, as a scientific "authority," Mr. Bourne must "not dream of sitting in judgment." Has Mr. Armstrong altered the case in the least? Is it not still true that Mr. Bourne read Tredgold, edited Tredgold, and published Tredgold, with his name editorially in front of it, and yet never knew that it was Tredgold? —and that, too, when Tredgold was certainly the first of existing works upon the steam engine!

Mr. Armstrong seems to think it to Mr. Bourne's credit that the disquisitions of Tredgold, in an altered form, and under another's name, should have been lightly esteemed by Mr. Bourne. We do not; for we know too well how foolishly such expressions as "superfine speculations," "needless luxuriance," "mathematical sublimities," &c., are applied to important investigations by persons unacquainted with mathematics. And besides this, Mr. Armstrong intimates that if Mr. Bourne had understood it was "Tredgold he was condemning," he would have modified his words. In this he would have done wisely. It is impossible that our opinion of Mr. Bourne can be raised by the fact, that he considered as worthless, that which had so much contributed, in the judgment of scientific men, to make the fame of Tredgold.

It would probably appear vindictive in us to add here the opinions we have heard "practical" men express in respect to the "practical" portions of the Artizan Club Treatise on the Steam-Engine; and beside this, it is quite true, as Mr. Armstrong says, that engineers themselves are sure to form a tolerably accurate estimate of practical matters for themselves. To them, therefore, we willingly confide the task of determining for themselves whether what Mr. Bourne has written is sound or unsound, true or false, original or pirated.—Ed. M. M.]

HEARDER'S INDUCTION COIL.

To the Editor of the Mechanics' Magazine.

Sir,—I regret being unable to reply earlier to the observations made in reference to Hearder's Induction Coil, and some remarks of mine thereon, which appeared in the Magazine on 27th December. In my communication I endeavoured to show that, so far as the principles of construction of Hearder's Coil are described, there is nothing *new;* and if the results described are owing to the great quantity of wire employed, without any improvement in the principle of construction, as regards insulation and the proper relation of the primary and secondary coils, I am still at a loss to know why you should look upon this as an important invention. Those who have carefully looked at M. Ruhmkorff's have no difficulty in determining upon what its superiority depends. The mystery that has hung over it is chiefly owing to its cost being such as few like to pay for the information to be obtained from an examination.

But you tell us that the superiority of Hearder's coil is evidenced by the experiments at the Plymouth Mechanics' Institution, in March last, when his 6-ins. coil was tested against Ruhmkorff's 12-ins., with three times the quantity of wire, the same exciting battery being used in each case. Had you not told us that this experiment was conducted by an eminent electrician of London, we should never have thought so, and might have passed it by with the remark that it was not at all conclusive. I would, therefore, suggest to his eminence, that future experiments for testing the comparative merits of these machines will be much more satisfactory if conducted on different principles.

If the same battery is used, the resistance should also be the same in each, and not as 1 to 3. If the battery was just sufficient to saturate the primary of Hearder's, it obviously could not saturate Ruhmkorff's, of three times the resistance; hence I am not at all surprised to hear of the superior effects of the 6-ins. over the 12-ins., and not at all convinced of the inferiority of the latter.

As to the difficulty of extending the principle to the production of higher results being in a ratio greater than the effect, of that I am quite aware, and also that this is equally true of the little as the great, which you omit to mention.

The whole matter may be stated in a few words. Mr. Hearder has constructed a machine giving certain results; other individuals have constructed less powerful ones, on equally sound principles, so far as Hearder's have yet been made known to the public, and therefore the principle may be extended to produce results equally great without any new discovery whatever. You have not mentioned a single point of importance in which Hearder's differs from those referred to in my former communication. I did then refer to one particular in which they appeared to differ, namely, the length, and to this you do not reply a word.

I am, Sir, yours, &c.,

J. F.

[We confess that we do not understand the precise nature of the remarks of our correspondent—he has so strangely mixed up things which have no connection with each

other. We would remind him that the secondary wires, both of Ruhmkorff's and Hearder's induction coils, are separate from, and independent of the primary ones; and as they do not conduct the battery current, their resistance has nothing to do with the matter. The electrical effects produced in them are derived from a distinct source, viz., from the reaction of the induced magnetism. About the relative lengths of the primary wires of the two instruments, we can say nothing, since the length of Ruhmkorff's is a secret, and the length of Mr. Hearder's varies according to the size of the instrument which he constructs.

We have not designated Mr. Hearder's instrument an "important invention;" we do not consider that either Ruhmkorff or Hearder have INVENTED anything in the new instrument; they have only applied more correctly and efficiently than others, principles already known, and we still contend that Mr. Hearder has done this to a greater extent than any one else.

We do not consider the trifling effects mentioned in our correspondent's former letter as worthy of being mentioned in comparison with the extraordinary effects of Mr. Hearder's coil. In testing Ruhmkorff's and Hearder's coils, they must be looked upon as the intermediate agents between the battery power expended and the results produced; and we consider Hearder's as the superior instrument, because it produces a greater result with the same amount of battery power. How it does this as compared with Ruhmkorff's, we cannot determine, without knowing the precise arrangement which the latter has adopted, since, other things being equal, the effects produced ought to be in proportion to the length of wire employed; and since in Hearder's small machine, with 1½ miles of secondary wire, more than twice as much effect was produced as would be obtained with one of Ruhmkorff's, containing between 3 and 4 miles of wire, and with the same battery, there can be no question as to the superiority of Hearder's machine; and we would ask our correspondent, if with a Ruhmkorff's machine of any size that has yet been made, he can produce with any battery that he chooses to apply to it, such effects as are produced by Hearder's machine, described in No. 1740.

With regard to the mode of conducting the experiments, we have all confidence in it. Mr. Hearder is an old and experienced practical electrician, and is, indeed, a remarkable instance of indomitable perseverance. It may not be generally known that Mr. Hearder was deprived of his sight about twenty-five years ago, by an accident which occurred to him during his chemical investigations—a circumstance which, whilst it would have disheartened many others, only seems to have excited him to redoubled efforts in the field of science. We know that Mr. Hearder never met with Ruhmkorff's coil, or even a description of it before he made his own, and the great differences between his mode of construction and that followed by M. Ruhmkorff evidence an amount of originality which would entitle him, in our opinion, to something more than the simple merit of having only improved the instrument.—ED. M. M.]

TONNAGE REGISTRATION.

To the Editor of the Mechanics' Magazine.

SIR,—Referring to the letter of "Veritas" in your last number (1743), the readers of the Mechanics' Magazine must have noticed, that from the time your Editorial articles elicited from me the statement that my object was not to subvert the existing law of internal measurement as a measurement of capacity, but in addition thereto, to make good the deficiencies of the law with a view to our system of tonnage registration being so completed as to supply further data usefully available for mercantile, statistical, and scientific purposes,—from that time our correspondence became the medium of mutual explanation rather than of discussion; and it was soon found that our opinions as respects the deficiencies of the present registration for the purposes of public utility, above referred to, constituted common grounds of concurrence, as set forth by my letter of 24th September last, published in the Mechanics' Magazine, No. 1729, which closed our correspondence.

I am, Sir, yours, &c.,
CHARLES ATHERTON.

Woolwich Dockyard, Jan. 5, 1857.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

HEIFFOR, T. *An improved method of manufacturing razor blades.* Dated Apr. 26, 1856. (No. 1006.)

This invention consists in rolling steel in strings or strips of a concaveor hollow form, the shape of a razor blade, and in cutting away part of the steel so as to leave sufficient to form the tang which is afterwards fashioned.

RESTELL, T. *Improvements in fittings or appendages for doors, and in the means of fixing or attaching the same.* Dated Apr. 28, 1856. (No. 1009.)

This invention, in so far as it refers to door handles, consists in forming a portion of the spindle of one of the handles screw-threaded on the outside, and slotted down the middle as far as the screw extends, so

as to form a two-branched spindle threaded on the outer surface, which is passed through the door, the other handle being then screwed on to it, and the two secured together by a screwed pin. The invention, in so far as it refers to door plates, consists in forming a dovetail groove in the back of the top plate, which extends nearly, but not quite, along or across it, and in securing the plate to the door to which it is to be fixed by slipping the groove over a metal block, springs, or catches secured on to the door, and so formed as to hold against the sides of the groove.

RUCK, W. D. *An improvement in tanning hides and skins.* Dated Apr. 28, 1856. (No. 1011.)

The hides and skins having been properly prepared as usual, are placed in a closed vessel from which the air is exhausted, the tanning liquor run in, and subjected to pressure. A portion of the liquor is from time to time withdrawn, and fresh liquor introduced.

HICK, J. *Apparatus for equalizing the temperature of the water in that kind of steam boilers generally called multitubular boilers.* Dated Apr. 29, 1856. (No. 1013.)

This invention consists in introducing vertical plates in that portion of the boiler which the tubes occupy, for the purpose of dividing the body of the water, the object being to produce a current in, and thereby to equalize the temperature of, the water.

CROSLAND, J. S. *Certain improvements in furnaces and steam generators for locomotive steam engines and other purposes.* Dated Apr. 29, 1856. (No. 1014.)

This invention cannot be fully described without engravings. Among other things, it comprises the arrangement of one fire over another, for obtaining more fire-grate area, and for causing the smoke and sulphur of the lower fire to pass through the upper—the use of sliding dampers within the fire-box—the arrangement of an ascending and unobstructed return draught within the fire-box—the use of tubes across the fire box as bearers of an intermediate or upper fire, and as bearers of the lower fire, and the placing alternately of two or more common fire bars between the tubes—the arrangement of an upper central and intermediate ash pit within the fire box—the forming by water spaces a channel for the ashes of the upper fires to drop through into the common or lower ash pit—the arrangement of an internal blast chimney flue, for sustaining a firm blast of exhaust steam before exposing such exhaust steam to cooling surfaces—the use of the exhaust steam and heated air, after having quitted the ordinary blast flue or chimney, in combination with a multitubular chimney—a certain multitubular or multiwaterspace chimney for generating steam, absorbing the heated air that has left the heating surface of tubes and flues of boilers, absorbing the flying exhausted steam after the same has produced the blast for the furnace, condensing without vacuum the flying exhausted steam, and reproducing feed water which is pumped, coupled with the reserve supply, into the said multitubular chimney, or into the tubes or separate pipes contained in the improved outer chimney; and this combination of means amounts to conveying back into the boiler the whole of the exhausted steam—the employment of cold air passage tubes in the flues or chimney pipe, or exposed in the open air, through which the exhausted steam, vapour, and heated air pass, for, in both cases, promoting condensation and subsidation of the exhaust steam and water—the admitting of cold air into the chimney flues for promoting condensation and subsidation of the exhaust steam and water—the passing of the water of condensed exhaust steam through filtering beds, and the employment of cotton and hempen waste, &c., for filters of exhaust steam water; and the employment of tube rods and cleaners in combination with the multitubular chimney.

GREENSHIELDS, T. *Improvements in sleepers for railways.* Dated Apr. 29, 1856. (No. 1015.)

This invention was described and illustrated at page 537 of No. 1739.

RAMMELL, T. W. *Improvements in pen and pencil-holders.* Dated Apr. 29, 1856. (No. 1017.)

In this invention the case is made with a slit having on either side enlargements which will admit of an enlargement of the pin or projection, which is fixed to the spring tube of the pen or pencil, passing into one or other of the enlargements, and becoming locked or held therein.

BOSS, I. A. *Improvements in preparing cane, in order to render it suitable to be used as a substitute for whalebone* (A communication.) Dated Apr. 29, 1856. (No. 1018.)

The cane is first cut by two circular saws, being moved past by two grooved rollers, and supported by a grooved bed on which it is pressed by a roller. The canes having been cut on four sides, are impregnated with a preparation of animal matter obtained as follows:—Bones are steeped in a solution of chloride of lime, dried, softened by digesting with steam, and then combined with a solution of alum, and the filtered liquor obtained is employed for impregnating the canes, which are next dried in currents of air, soaked in a solution of alum, and again dried and finished for use.

PILLING, W. *An improvement in the treatment of yarns or threads, and in the apparatus*

connected therewith. Dated Apr. 29, 1856. (No. 1019.)

This invention relates to the treatment of yarns or threads preparatory to operations in which they are submitted to wet processes, and consists in exhausting the air from them, to render them more susceptible of the liquid with which they are to be impregnated.

JOHNSON, J. H. *Improvements in anchors.* (A communication.) Dated Apr. 29, 1856. (No. 1020.)

This invention relates to certain constructions of moveable anchor stocks, composed either of iron and wood combined, or of iron only.

SMITH, J., and W. CRAVEN. *Certain improvements in machinery or apparatus for dressing, machining, and finishing velvets, velveteens, and other fabrics.* Dated Apr. 30, 1856. (No. 1021.)

This invention cannot be described without illustrations.

DYER, S. *Improvements in reefing, furling, and setting the sails of ships and vessels.* Dated Apr. 30, 1856. (No. 1023.)

This invention consists in effecting the above objects from the deck of a ship or vessel, or in other convenient position, by the use of certain appliances which cannot be described without illustrations.

RIGBY, J. *Improvements in machinery for grinding or sharpening the card cylinders and rollers of carding engines.* Dated Apr. 30, 1856. (No. 1024.)

This invention relates to an improved arrangement of self-acting mechanism for grinding such cylinders, which is applied to them in their places, and an improved arrangement of self-acting mechanism in which card rollers are placed to be ground.

MANEVY, L. J. B. *Certain improvements in manufacturing cast steel.* Dated Apr. 30, 1856. (No. 1025.)

This invention refers to the manufacture of cast steel of every description, by decarbonising melted cast-iron in closed vessels by the admixture of pure oxides of iron alone, or it may be with the further addition of wrought-iron, lime, and potash or soda. The oxides of iron and wrought-iron act as the decarbonising agents, while the oxides of calcium, potassium, and sodium take up the sulphur, phosphorus, and silicium, and form sulphurets, phosphorets, and silicates.

JONES, W. *Improvements in apparatus for regulating the pressure and flow of steam, water, and other fluids.* Dated Apr. 30, 1856. (No. 1026.)

The object is to regulate the pressure and flow of fluids, within boilers, pipes, or other chambers, the apparatus also acting as a safety valve, or for obtaining a desired amount of pressure or of heat in the case of steam. The patentee causes the supply, acting on a column of mercury, or other fluid, to open and close a valve.

NEWTON, W. E. *An improved method of, and machinery for polishing the surface of glass, stone, metal, or other materials capable of being polished by friction.* (A communication.) Dated Apr. 30, 1856. (No. 1027.)

In this invention the friction of a flat rotating disc or table is caused to give the material under operation an independent rotary motion around its own axis, and thereby to ensure the equable distribution of the grinding or polishing action over the whole surface of the material exposed.

DEFRIES, N., and G. H. BACHHOFFNER. *Improvements in gas fires.* Dated May 1, 1856. (No. 1028.)

This invention consists—1. In forming the gas burners or jets used for such fires of argillaceous materials, mixed with metallic oxides or metals in a finely divided state. 2. The patentees form the compound into small thin layers, having openings through them, over which they place threads or films of asbestos, thus obtaining much the same appearance as a coal fire.

MAPPLE, H. *Barometers.* Dated May 1, 1856. (No. 1029.)

This invention consists chiefly in suspending or balancing the instrument on a point or points, pivot or pivots, or a knife edge, or suspending it by a flexible material, as a silken or other cord, a fine flexible steel spring, or any other suitable material which allows the instrument to vibrate or oscillate freely, a pointer or hand being fixed to the instrument, and moving in front of an index or dial. Or a segment of a circle may be fixed to the instrument to move before a fixed hand or pointer properly divided, and shows by its motion the most minute change in the atmosphere.

CAREY, S. *Improvements in water-carts and barrows.* Dated May 1, 1856. (No. 1032.)

This invention embraces a number of arrangements, including the use of telescopic perforated tubes, flexible hose, pipes with universal joints, distributing boxes or trays, valves, &c.

BROOMAN, R. A. *Improvements in compressing, regulating the pressure and flow of, and conveying gas, parts of which are applicable to air and other fluid pumps.* (A communication.) Dated May 1, 1856. (No. 1033.)

This invention consists—1. Of an improved pump for compressing gases, together with its appendages, applicable also for air and other fluids. 2. Of an improved tap or cock. 3. Of a regulating apparatus. 4. Of an apparatus for the conveyance of gas.

BROOMAN, R. A. *Improvements in machinery for felting or planking hat bodies.*

(A communication.) Dated May 1, 1856. (No. 1034.)

The improved machinery consists of an endless floor passing over drums, supported in a frame, and rotating so as to impart to the endless floor a slow progressive motion. Over the floor is suspended a felting plate, leaving just space enough to pass and squeeze the hat bodies between. The hat bodies being put in at one end are carried along by the endless floor, while the felting plate is kept in rapid vibration.

SMITH, N. *Improvements in clod crushing rollers, parts of which are applicable to other descriptions of rollers.* Dated May 1, 1856. (No. 1036.)

This invention consists—1. In a clod-crushing roller composed of cylinders with knibs or projections upon the face thereof. The projections are in the form of a cone, or of a cone with a channel or groove, or any other suitable form, which will simply crush or crumble clods of earth without cutting the land. 2. In cutting a wheel or spokes and boss on to hollow rollers for the reception of an axle, and in forming one or more of the spokes and the boss hollow, or with an aperture therein for containing a supply of lubricating material.

SMITH, A. *Treating vegetable fibres, in order to fit them for use as a substitute for bristles in paint and other brushes.* Dated May 1, 1856. (No. 1037.)

This invention consists in "flagging" or pointing the ends of vegetable fibres by rough grinding them on a stone, and then finishing them upon a drum covered with glass, sand, or emery cloth or paper of various degrees of fineness.

HUNTER, S. *An improvement in anchors.* Dated May 1, 1856. (No. 1038.)

This invention was described and illustrated at page 538 of No. 1739, vol. lxv.

PEARCEY, R. *Improvements in machinery or apparatus for twisting cotton and other fibrous substances.* Dated May 2, 1856. (No. 1040.)

The patentee describes a machine which is designed to put either much or little permanent twist into the sliver or roving at the roving or tube frames, according as may be required, and which consists of a modification of "Dyer's tube frame."

NAYLOR, W. *Improvements in power hammers and riveting machines, part of such improvements being applicable to the manufacture of bolts or rivets.* Dated May 2, 1856. (No. 1042.)

The following are the chief features of this invention. It consists, first, in the use of a piston-rod or ram fitted on each side of the piston, the upper or back end of such piston-rod working in a closed blank pipe, but not through into the atmosphere. The cylinder covers at each end form the guides to the hammer, but on one or more sides of the piston-rod or ram, above or behind the piston, are grooves working along guides in the cylinder cover to prevent the piston or hammer from turning round when at work. Steam passages are provided in the upper or back cylinder cover, communicating between the upper or back end of the cylinder and the blank pipe on the cover. The valve gear is worked by a projection or roller connected with the ram or hammer block. When used as a riveting machine, the patentee employs one double-acting power hammer, working either direct or through a lever, to drive the pin to be riveted into its place, and afterwards to hold on the end of the pin, by the steam or air acting on the piston, while a second double acting power hammer, working direct or through a lever, completes the riveting. He also makes use of an eccentric or screw, or some other mechanical power, to hold the plates to be riveted during the riveting. In making rivets he uses a circular block, revolving on a shaft vertically. The die to receive the pin to be formed into a bolt or rivet consists of perforations made in the circular block from the outside towards the centre, and of such length and diameter as the rivet or bolt is to be when finished. On one side of the circular block are holes corresponding in number with the die holes for the rivets, and a pin actuated by a spring or weighted lever is inserted into one of the side holes to hold the block steady while the rivet is being formed by the hammer. A communication is made between the bottom of each die hole and the bottom of the corresponding side hole, and a jet of water may play into the side holes to keep them cool, and also to contract the heated rivet, that it may fall out during the hammering of the others as the rotation of the block proceeds.

GORDON, A. *Improvements in evaporating, boiling, and distilling fluids, and generating steam.* Dated May 2, 1856. (No. 1044.)

This invention consists in employing reflecting apparatus or refracting lenses, or both combined, in such a manner that the heat of the sun's rays is rendered applicable for evaporating, boiling, and distilling fluids and generating steam.

BROWN, H. E. *Improvements in the description of hinges denominated concealed hinges, for carriage doors and doors of every description.* Dated May 2, 1856. (No. 1045.)

The patentee constructs a plate having in it a recess into which the end of the arm of the hinge engages, the said recess and arm of the hinge constituting a dovetail joint.

ROOKE, S. *A new or improved manufacture of stair rods.* Dated May 2, 1856. (No. 1046.)

This invention consists—1. In manufacturing stair rods by coating iron rods with copper, by immersing the same in a solution of a salt of copper, or by rubbing the said solution thereon, and afterwards drawing through a draw plate, and finally lacquering the copper rods with a highly coloured yellow lacquer. 2. In manufacturing stair rods having a silver appearance, by coating iron rods with tin, and making them smooth by drawing them through a draw plate.

THOMPSON, H. A. *Improvements in haymaking machines.* Dated May 2, 1856. (No. 1048.)

This invention consists—1. In the adaptation of solid axles of metal, one on each side of the machine, revolving in bearings, which axles carry one of the travelling or sustaining wheels and cog wheels which drive the fork barrels, these wheels being securely fastened to each axle respectively, and turning with it. 2. In the employment of bearings for the axles to work in, so inserted in the side framework of the machine as to permit them to be removed and replaced by others when worn out. 3. In the form of the lines or teeth of the lifting fork, which are so shaped as to present a curved surface to lift the hay when turning in one direction, and a straight or slightly curved surface to throw from them when turning in the opposite direction. 4. In the arrangement of the side frames from the shafts to the wheels so as to enable them to be attached on the outside of the boxes which contain the cogged gear work.

CAMPBELL, R. T. *Improvements in machines for reaping and mowing.* Dated May 2, 1856. (No. 1049.)

This invention cannot be described without illustrations.

FONTAINEMOREAU, P. A. L. DE. *Improvements in electric telegraphs.* (A communication.) Dated May 3, 1856. (No. 1050.)

The apparatus at each station consists—1. Of a motor or wheelwork arrangement wound up by electro-magnetism and having a continuous movement. 2. Of an improved alphabetical keyboard current breaker for the transmission of the dispatch. 3. Of a printing or typographical apparatus to be used at will, and worked by a separate battery.

GARSIDE, W. *A new and improved method of letting off the worsted or yarn from the bobbins employed in weaving carpets, and other similar fabrics in which bobbins are employed during the manufacture thereof.* Dated May 3, 1856. (No. 1054.)

This invention consists in the use of certain mechanism for obtaining an uniform amount of tension on the worsted or yarn as it is drawn off the bobbin. Upon a horizontal cross bar two upright pieces of metal are fixed and adjusted by set screws to the width of the bobbin. There is a moveable bar, over which the worsted or yarn passes from the bobbin, and this bar works on the slides, so as to fall thereon or therewith as the worsted diminishes on the bobbin.

BULMER, W., and I. SHARP. *Improvements in the manufacture of bricks, tiles, and other articles from plastic substances.* Dated May 5, 1856. (No. 1057.)

This invention was described and illustrated at page 560 of vol. lxv.

HOLDEN, I. *Improvements in preparing and combing wool and other fibrous substances.* Dated May 5, 1856. (No. 1058.)

These improvements relate—1. To means for effecting the movements of gill comb bars, and consist in employing lifting and lowering bars with arms extended downwards so as to be acted upon readily by cams or tappets at the lower part of the framing. Also in giving the requisite motion to the levers or other pushers used by means of cams. Also in the employment of guides to the gill bars, which serve to guide them in rising and falling, as also to hold them after each rise and fall. Also in forming the ends of the bars deeper than usual, rising upwards, say to the height of the gill teeth. 2. To forming the keeping plate for holding the fibre from coming out of the carrying or travelling combs while being worked by other combs double, one plate being formed open to prevent choking of the parts by the fibre. 3. To employing brush card or other toothed surfaces upon cylinders or rollers as cleaning or doffing means to gill and other combs, and in the combination sometimes therewith of a stationary doffing plate. 4. To employing an extra pair of rollers in front of, and close to, the horizontal fluted drawing-off rollers used in drawing the sliver from the travelling comb. By the first head of the invention, an intermittent action is obtained in the gill bars, and when used as feeding means, each comb as it brings forward its fibre rests for a short time with the tuft projecting; and the invention relates—5. To operating such tuft while it is held between the last gill comb and a nipping bar. 6. To employing a double or two pair of nipping apparatus to act in succession upon each tuft, in taking detached portions of fibre from the feeding means. 7. In employing as feeding means when nipping apparatus is employed to detach portions of fibre, rollers and guides, independently of gill or other such teeth, but aided by

holding jaws or surfaces. 8. When the gill frame is stationary, and the gill combs used as working combs enter successively into the beard of the fibre previously filled on by filling heads, and projecting from the travelling combs, the patentee gives a curved form to a part of the middle of the gill combs so used corresponding to the circular form of the travelling comb.

CHADBURN, A. *An improved construction of pressure gauge.* Dated May 5, 1856. (No. 1059.)

This pressure gauge was described and illustrated at page 607, of No. 1742, vol. lxv.

GREGORY, W. *An improvement in the construction of roofing tiles.* Dated May 5, 1856. (No. 1060.)

The tiles are provided as usual with a rib at one edge, and an arched lapping piece at the other, but to effect a complete, in contradistinction to a partial lap, at right angles to these, or in a line parallel with the ridge of the roof, the patentee forms in the arched lapping piece of each tile (except the eave tiles) a recess or cup to receive the ends of the arched lip of the adjoining tile. This recess or cup he makes of a depth equal to the width of lap required for two adjoining rows, and the workman or tiler is thus provided with a gauge for fitting the tiles together. The tiles being provided with knobs on their underside, may be simply hung upon the laths as usual, or may be secured by nails. He also forms recesses at the opposite edges of the ridge tiles, so that they will completely overlap the upper edge of the top row of tiles at the opposite sides of the ridge, and produce a water-tight joint, which may, when desirable, be further secured by a thin line of mortar or cement.

BEUDANT, A. L., and J. L. M. P. BENOIT. *Certain improvements in treating ores of copper containing arsenic and antimony.* Dated May 6, 1856. (No. 1061.)

"The treatment of copper ores," say the patentees, "may be reduced to the treatment of a coarse metal or matt containing sulphur, iron, copper, antimony, and arsenic in variable proportions, and sometimes other metals, such as silver and gold. By our invention we separate the copper from the antimony and arsenic, and we obtain the antimony and a large portion of the arsenic in the metallic state, and nearly pure, by a precipitation effected in the metal matt, and we volatilise the remainder of the arsenic during the operation. We obtain this result by certain operations or modes of treatment which may be employed together or separately."

BLAKE, O. *Improvements in applying practically the principle of internal reflection within transparent substances.* Dated May 6, 1856. (No. 1062.)

These improvements relate—To grating illuminators, or gratings filled with glass. If one of these be inserted into a ship's deck, the light which enters the slips of glass, fixed edgwise in the openings of the grating, passes through with no great diminution, while the narrowness of the glazed apertures combined with the depth of the glass, and the metal or other substance of which the divisions may be made, gives strength so great that heavy weights may be thrown upon or dragged across the grating without injury thereto, and further, slipperiness of surface is avoided by the slightly raised edges of metal or other substance which forms the divisions between the pieces of glass.

WRIGHT, J. *Improvements in apparatus for lowering ships' boats.* Dated May 6, 1856. (No. 1063.)

The boat is secured by a chain passed round it on each side just below the gunwale, and made fast at each end of the boat to the davits. Other chains are attached to the first chain in two or more places; these pass under the boat, coming up on each side; and the whole forms a kind of cradle in which the boat hangs securely. The davits are attached to the side of the vessel by joints at the lower end of each, to allow them to be lowered outwards so that their ends may descend below the water, their descent being regulated by a chain or rope fastened to them, and rove through sheaves on the bulwarks, and then wound in contrary directions round a revolving barrel, so that the davits may be lowered or raised simultaneously. On to the axis of this barrel is fixed a wheel of much larger diameter, and so formed that round it a rope may be wound, so that when the davits are being lowered the rope winds on to this larger wheel, and according to the speed at which it is suffered to run out it regulates the descent of the davits, or if hauled upon, hoists them up. As the davits descend below the water the boat floats clear.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

NAPIER, G., and J. MILLAR. *Improvements in the manufacture of gas from coal, tar, or other bituminous, resinous, or fatty matter.* Dated Apr. 28, 1856. (No. 1007.)

These improvements relate to the method of introducing the above-named matters into the retorts. The inventors provide a number of retorts placed in communication with a main pipe to convey the gas as usual, and also in communication with another pipe, to supply the matters, which are kept in a reservoir near the retorts in a heated

state, that they may have sufficient fluidity for the purpose. A force pump communicates with the supply pipe, whereby the fluid matter is forcibly injected into the retorts through suitable jet apertures, which distribute them over the interior surface of the retorts. The retorts being kept heated, the whole injected matter is immediately converted into gas, and passes off through the main pipe.

DUBOS, J. C. B. *An improved electro-magnetic apparatus.* Dated Apr. 28, 1856. (No. 1008.)

This invention consists in the employment of the force resulting from the reciprocal attraction of two electro-magnets with opposite poles, whatever the arrangement of the apparatus.

GEERING, H. *An improvement or improvements in metallic bedsteads, chairs, couches, and other articles for sitting, lying, or reclining upon.* Dated Apr. 28, 1856. (No. 1010.)

This invention consists in fitting the side rails into vertical recesses in corner blocks in a peculiar manner.

GRAFTIAUX, C. J. *Improvements in rotatory steam engines.* Dated Apr. 29, 1856. (No. 1012.)

The inventor proposes, in constructing a rotary steam engine, to pass the steam through a pipe by means of a stop-cock; this pipe will at its extremity be furnished with a stuffing box, thence the steam will be passed through a conductor to a drum, and thence by a small opening to the cylinder, and force the piston past a slide which is to be simultaneously withdrawn by means of an eccentric. The steam, having acted, will pass on into another compartment of the drum, and thence be discharged.

TITTERTON, C. *An improvement in the manufacture of white zinc.* Dated Apr. 29, 1856. (No. 1016.)

The inventor employs refuse products containing zinc, which result in various branches of manufactures where zinc is made and used, such refuse consisting of ashes, dross, and skimmings containing zinc, and he combines these matters with broken coke or carbon, places the mixtures in suitable muffles or retorts, distils off the vapours of zinc, conducts such vapours into suitable chambers with atmospheric air, and thereby produces white zinc.

SPILSBURY, F. G. *Separating metals, metallic oxides, and metallic acids from their ores.* Dated Apr. 30, 1856. (No. 1022.)

The inventor takes the ore and mixes it with a concentrated solution of caustic potash, or soda, in water, and subjects this mixture to continued ebullition in an iron boiler.

NEWTON, W. E. *An improved preparation of phosphoric acid.* (A communication.) Dated May 1, 1856. (No. 1030.)

This improved acid is made from carefully washed and burned bones, which, after being finely ground, are sifted with continual stirring into freshly diluted oil of vitriol. The mass is stirred from time to time for three days, when ordinarily the action will be complete, and there will have resulted phosphoric acid, superphosphates, and sulphate of lime, with a small proportion of salts of magnesia and soda.

PERRON, C., and V. BOULLAND. *An improved knitting machine.* Dated May 1, 1856. (No. 1031.)

In this improved machine the various pieces of which it consists are new, and are connected with one another, and set in motion by a crank or a pulley. The movements required for obtaining the fabric take place at once, no interval of time being left between the end of a row of meshes and the coming up of the next. The whole set of spindles is moveable, and the fabric at work adjoining the spindles is laid behind the plates or bands.

PATERSON, A. J. *An improvement in or connected with hawsers and other ropes or chains used in towing vessels.* Dated May 1, 1856. (No. 1035.)

The object of this invention is to prevent the breaking of the hawser or chain by any sudden strain; it consists in connecting the ends of the rope or chain to an elastic agent, such as India-rubber or metal springs, or to an atmospheric break, or to a combined atmospheric and hydraulic break.

COWLEY, J. *Improvements in the manufacture of paper from straw and other vegetable substances.* Dated May 2, 1856. (No. 1039.)

The straw is cut into short lengths, and placed in an iron vessel having a false bottom to allow the fluids to circulate. Near this vessel is fitted a generator in which is a coil of pipe connected with a boiler. To the upper part of the generator is fixed a pipe or column, which is carried over the edge of the vessel, and terminates at the centre thereof in a rose head. Alkaline liquor is placed in the generator, and the steam turned on from the boiler, by which the liquor is forced up the column, and dispersed over the surface of the straw. To make the liquor circulate through the straw without manual attention, a pipe is carried from the vessel to the lower part of the generator. As the liquor percolates the straw it descends the pipe, is carried into the generator, receives fresh heat, and is again forced up the column and over the straw. To maintain a regular heat in the liquor and in the straw, a coil of pipe is connected with the boiler, and either passes through

the straw, or is carried round the sides of the receiver. After boiling, the straw is washed by an agitator, passed through a beating engine, and finally bleached by chlorine liquor.

WAITE, W. *An improvement in the construction of sleepers and rails for railways.* Dated May 2, 1856. (No. 1041.)

This invention consists—1. Of a grooved longitudinal sleeper. 2. Of a rectangular rail, adapted to the above sleeper, and fixed thereto. 3. Of a peculiar rail, two sides of a square in form, capable of being reversed, or fixed with either of its two outer sides uppermost, and adapted for fixing to the above described sleeper. 4. Of another rail adapted to that sleeper.

DAY, W. *Improvements in clod crushers or rollers for rolling, pulverizing, or pressing land.* Dated May 2, 1856. (No. 1043.)

These improvements consist in making use of narrow-edged discs, or cylinders, so arranged as to work side by side with other broad faced cylinders, or discs upon the same axle. The narrow discs the inventor prefers to use with serrated edges for penetrating large clods, and placed side by side with broader faced cylinders having nearly plain faces, and by having the centre holes of the latter larger than the others, he combines a method of crushing with an abrading and self-cleaning action.

BROOMAN, R. A. *Improvements in machinery for bending or shaping timber.* (A communication.) Dated May 2, 1856. (No. 1047.)

This invention is adapted for the formation of curved timber for shipbuilding. One improvement consists in such an arrangement that both ends of the clamping trough are moved simultaneously. A second consists in preventing the breaking of the fibres on the outside of the wood at the bend, by dividing the draw-chain, and affixing it at the middle to a strong moveable block which may be set up by a strong screw, so as to support the fibres at the weak point. Means are also provided for keeping up the pressure at this point after the timber is removed from the bending trough, and until it has become set.

WRIGHT, J., and T. GORRERY. *Improvements in railway carriage and other springs.* Dated May 3, 1856. (No. 1051.)

This invention consists in using cast or other kinds of steel or other metal sheets or plates of a less thickness than No. 6 wire gauge, being placed together in the formation of springs, instead of plates or bars of a greater thickness.

THOMAS, E. *Improvements in the construction of counting apparatus for ascertaining and indicating the number of rotations made by shafts or spindles in various descriptions of machinery.* Dated May 3, 1856. (No. 1052.)

The object here is effected by adapting to the inner end of the spindles of the indicating dials a small ratchet pinion provided with a click which will prevent it from rotating in any but the right direction. Other mechanical equivalents may be employed in place of the ratchet pinions to effect the same object, &c.

CUNNINGHAM, H. D. P. *Certain apparatus to be applied to boats to increase their buoyancy and stability.* Dated May 3, 1856. (No. 1053.)

This invention consists in adapting to boats certain buoyant agents, which will at the same time convert an ordinary boat into a life-boat, and serve as fenders to prevent damage in going alongside of ships, quays, or other bodies.

BLOOMER, C. *Improvements in the manufacture of spikes and bolts.* Dated May 5, 1856. (No. 1055.)

This invention consists in making the spike or bolt of pieces of rod or bar iron, laid together longitudinally, and then welded or otherwise secured firmly at the head, or for a portion of their length, thus avoiding the slitting process used in a patent of the inventor's, dated 3rd March, 1855.

WILLIAMS, G. *Improvements in fog and dark night alarm signals.* Dated May 5, 1856. (No. 1056.)

This invention, chiefly applicable to ships, consists in the combination of a trumpet-shaped instrument with a whistle, thus producing two distinct sounds. The apparatus may be fixed to the air vessel of the fire engines carried on board vessels, or worked with an air pump.

CURTIS, W. J. *Improvements in constructing the permanent ways of railways.* Dated May 6, 1856. (No. 1064.)

In this invention the longitudinal bearers are made of bitumen, and it is preferred that each should be of a triangular form with the apex downwards. Other longitudinal bearers of iron are introduced into these, and by the cooling and setting of the bitumen are fixed in them.

FURNEVALL, J. *Certain improvements in the construction of valves.* Dated May 7, 1856. (No. 1069.)

In this invention one of the discs of which the valve is composed is stationary, and attached to the body of the valve, and the other is moveable, and furnished with a spindle fitting in a bush reaching from the fixed disc to the body of the valve; the spindle passes through the body of the valve, and has a handle or hand-wheel by which the position of the moveable disc is changed so as to make the openings in both the discs coincide if the passages are to be

opened, or *vice versâ*. A spring may be employed to keep the faces of the discs in contact. By these improvements the stuffing box hitherto required is dispensed with.

MARTIN, G., and A. L. NEWMAN. *Improvements in freeing or purifying animal fibres from admixture with vegetable matters.* Dated May 7, 1856. (No. 1070.)

The inventors first immerse the materials in a solution of soap or fatty matters, or a solution of a neutral salt, for protecting the animal fibres from the action of the acid employed to destroy the vegetable matters. They then dry the mixed materials, immerse them in dilute acid, again dry them, and subject them to the mechanical action of a machine by which the vegetable matters are reduced to powder.

PROVISIONAL PROTECTIONS.

Dated December 16, 1856.

2976. Charles Fréderic Vasserot, of Essex-street, Strand, mechanical draughtsman. Preserving salmon, trout, and other fish. A communication.

2978. William Frederick Thomas, of Newgate-street. Improvements in sewing machines.

2980. Frederick William Gerhard, of Trafalgar-square. Improved means of obtaining aluminium metal, and the adaptation thereof to the manufacture of certain useful articles.

2982. William Gossage, of Widnes, Lancaster, chemist. Improvements in the manufacture of sulphuric acid, and in the construction of apparatus used for such manufacture.

2984. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improvements in printing presses. A communication.

Dated December 17, 1856.

2986. Peter Armand le Comte de Fontainemoreau, of Rue de l'Echiquier, Paris. Improvements in obtaining motive power. A communication.

2988. John Platt, of Oldham, Lancaster, mechanical engineer. Improvements in mules for spinning. A communication.

2990. Frederick Levick, jun., iron master, and John James, furnace manager, both of Cwm Celyn and Blaina Iron Works, Monmouth. Improvements in the mode of utilizing the waste gases of blast furnaces.

2992. Charles Cowper, of Southampton-buildings, Chancery-lane. Certain improvements in electro-plating. A communication from L. I. Caussinus, of Paris.

2994. Vincent Louis Cazimir Renou, of Jersey. An improvement in the manufacture of spirit when rice is used.

Dated December 18, 1856.

2996. John Elce, of Manchester, machinist, and Samuel Hartley, of the same place, brass moulder. Improvements in machinery for moulding.

2998. John Draper, of Chiswell-street, Finsbury. Improvements in apparatus for grating and crushing salt and sugar.

3000. Joseph Bower, of Hunslet, near Leeds, manufacturing chemist. An improvement in treating animal matters in preparing them to be used for the manufacture of manure.

3002. Charles Fay, of Manchester, railway carriage builder. Improvements in railway carriages and breaks.

3004. François Donny, professor of chemistry, of Ghent, Belgium. Improvements in the manufacture of lamps.

Dated December 19, 1856.

3006. Louis Beaver, of Manchester, watchmaker. Improvements in machinery for propelling vessels.

3008. Robert Hyde Greg and Henry Russell Greg, both of Manchester, manufacturers, and James Hope, of Reddish, manager. Certain improvements in machinery or apparatus for polishing or finishing yarns or threads.

3010. James Penny and John Booth, both of Heckmondwike, York, corn millers. Improved machinery for washing, cleansing, and drying grain.

Dated December 20, 1856.

3014. John Edridge, of Birmingham, pin manufacturer. Improvements in the manufacture of hair pins, shawl and other dress pins, parts of which improvements are also applicable to the manufacture of clasps and similar dress fastenings.

3016. George Alexander Harrisson, captain in H.M. 79th Highlanders. Improvements in breech-loading fire-arms.

3018. Thompson Newbury, of Taunton, U.S.A. Improved machinery for making screws.

Dated December 22, 1856.

3020. Theodore Dethier, of Pimlico, cabinet maker. An improved knife cleaner.

3022. William Mill, of Birmingham, manufacturer. Improvements in joining bands, in connecting fastenings to bands, and in attaching bands to articles requiring the same.

3024. Frederick Sampson, of Gordon-street, Bradford, York, stuff finisher. Improvements in apparatus employed in singeing fabrics.

3026. Ebenezer Thornton, of Huddersfield, York, ironmonger. Improvements in furnaces.

3028. Thomas Lyon Thurlow, of Baynard's-park, Surrey, esquire. Improvements in reaping machines.

3030. James Redgate, Edwin Ellis, and John Cropper, of Nottingham. Improvements in bobbin net or twist lace machinery.

3032. George Davis, of Clerkenwell. An improved name and business plate for the outsides of doors and windows.

3034. William Beckett Johnson, of Altrincham, Chester, manager. Improvements in steam-engines and apparatus connected therewith.

3036. Frederic Prince, of Trafalgar-square, Charing-cross. Improvements in fire-arms.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

3056. Jules Henri Etienne Mareschal, of Paris, mechanical engineer. Improvements in hydraulic presses. Dated December 24, 1856.

3060. Charles Sylvester Rostaing, of Dresden, Saxony. Improvements in preparing and combining metallic substances for the production of colours, and in manufacturing the same. Dated December 26, 1856.

3076. George White, of Laurence Pountney-lane, Cannon-street, City. An improved poultice. A communication from Dr. Antelme, of France. Dated December 27, 1856.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," January 6th, 1857.)

1965. P. Benoist. An improvement in the construction of stereoscopes.

1969. W. Raester. Improvements in apparatus for regulating the supply of gas.

1983. J. Perry. Improvements in photography.

1984. W. H. Perkin. Producing a new colouring matter for dyeing, with a lilac or purple colour stuffs of silk, cotton, wool, or other materials.

1992. A. V. Newton. An improvement in breech-loading cannons and other ordnance. A communication.

1997. T. Lees. Improvements in lubricating parts of steam engines, and in apparatus and machinery to be applied for that purpose.

1999. A. V. Newton. An improvement in projectiles for cannon. A communication.

2002. W. Green, G. Holloway, and T. Grubb. Improvements in the manufacture of rugs.

2004. C. D. Gardissal. A new manufacture of artificial fuel. A communication.

2013. J. Brown. Improvements in swinging hammocks, and in the construction of bedsteads or couches, and in apparatus connected therewith.

2014. J. Fletcher and W. Fletcher. Certain improvements in the construction of weighing-cranes, or other similar elevating machines.

2020. C. Goodyear. An improvement in combining gutta percha and asphalt or pitch.

2029. R. H. Norris. Certain improvements in photography by the use of collodion in a dry condition, and for means of transferring photographic films.

2041. J. B. M. Jobard. Improvements in the manufacture of lamps.

2042. S. Hallen and E. Hallen. Improvements in rolling metallic substances.

2049. J. Picken. Improvements in the arrangement of the feed apparatus of machines for threshing or separating grain.

2059. J. M. Hayes. An improvement in the construction of cartridges for fire-arms.

2064. J. B. Dancer. Improvements in photographic cameras, and in the apparatus connected therewith.

2067. A. E. Duchateau. Improvements in stamp-presses, and stamps used therewith.

2078. G. P. Harding. Improvements in the manufacture of hats and other coverings for the head, and of parts thereof.

2087. F. Estivant. Improvements in casting metal tubes.

2088. A. G. Chalus. Certain improvements in stopping bottles and other vessels.

2089. J. Fowler jun. Improvements in machinery or apparatus for ploughing and tilling land by steam.

2126. J. Milnes and W. Thompson. Improvements in looms for weaving.

2145. J. H. Johnson. Improvements in fire-arms. A communication.

215,. G. C. T. Cranstoun, G. Young, and J. Lovell. Improvements in the application of steam for producing a boiling action in bleaching and other manufacturing processes.

2191. T. Greenwood. Improved machinery for trimming the teeth of wheels.

2215. A. Ford. Improvements in dissolving vulcanized India-rubber for waterproofing and like purposes.

2230. A. V. Newton. Improvements in gimlets, augers, and other tools which operate by a rotary motion. A communication.

2231. W. Johnson. Improvements in machinery for doubling and twisting fibrous materials. A communication.

2279. R. Morrison. Improvements in the construction of apparatus for lifting, lowering, hauling, and removing moveable articles by the direct action of either water, steam, or gaseous vapour.

2296. H. Naylor and J. Crabtree. Improvements in and applicable to machines commonly known as warping mills.

2656. J. H. Johnson. Improvements in projectiles. A communication.

2812. H. Hedgely. Certain improvements in spirit lamps.

2840. G. Collier and J. W. Crossley. Improvements in apparatus used in hot-pressing, and in the means of manufacturing parts of apparatus used for such purpose.

2941. G. Collier. Improvements in machinery or apparatus for the manufacture of piled fabrics.

2959. W. B. Birkby. Improvements in the manufacture of pointed wire fillets used in the preparation of flax, tow, hemp, and other fibrous substances.

2969. A. Turner. Improvements in the manufacture of elastic fabrics.

2989. W. E. Newton. An improvement in the manufacture of table-knives. A communication.

3000. J. Bower. An improvement in treating animal matters in preparing them to be used for the manufacture of manure.

3056. J. H. E. Maréschal. Improvements in hydraulic presses.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

3039. Julian Bernard.

1854.

3. Alfred Dawson.
8. Henry Lee Corlett.
10. David Kennedy.
11. James Stovold.
17. Julian Bernard.
19. David Hulett.
22. Edward Schischkar and Frederick Crace Calvert.
26. Leon Joseph Pomme.
27. John Mason and Leonard Kaberry.
30. Henry Hind Edwards.
38. William Edward Newton.

LIST OF SEALED PATENTS.

Sealed January 2, 1857.

1570. Thomas Chandler.
1574. Louis Cornides.
1575. Edwin Travis and Joseph Louis Casartelli.
1579. James Alexander Manning.
1597. Edward Charles Healey and Edward Ellis Allen.
1636. Stephen Martin Saxby.
1651. John Avery.
1686. Alfred Vincent Newton.
1702. William Noton.
1738. John Brayshay.
1810. William Edward Newton.
1964. Frederick Albert Gatty.
1976. Marc Antoine François Mennons.
2169. Robert Mushet.
2290. Pierre Armand Lecomte de Fontainemoreau.
2578. Samuel Middleton.
2584. Joshua Murgatroyd.

Sealed January 6, 1857.

1602. Joseph Henry George Wells.
1603. Joseph Henry George Wells.
1610. Abraham Herts.
1620. Ward Holroyd and William Noble.
1622. Timothy Jerome.
1642. Jean Baptiste Désiré Chevalier and Narcisse Rabouin O'Sullivan.
1645. Benoit Frédéric Ortet.
1671. James Ford and Peter Knowles.
1681. Henry Bragg, jun.
1694. Peter Hubert Desvignes.
1696. William Beevers Birkby.
1703. James Ryder and Daniel Bentley.
1710. Edward William Young.
1731. Elias Weisskopf.
2069. Ralph Reeder.
2076. Sidney Wesley Park and Edgar Stimpson Ells.
2156. Calvin Kline.
2544. Charles De Jongh.
2586. Ethan Campbell.
2614. William Henry Olley.
2616. Peter Cato, John Miller, jun., and John Audley.
2619. Henry Dircks.
2627. George Bertram and William McNiven.
2629. William Porter.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

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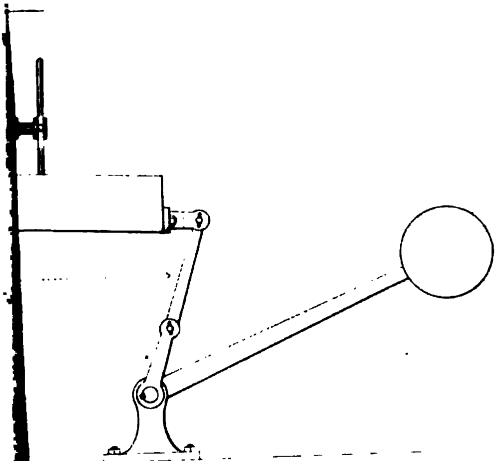

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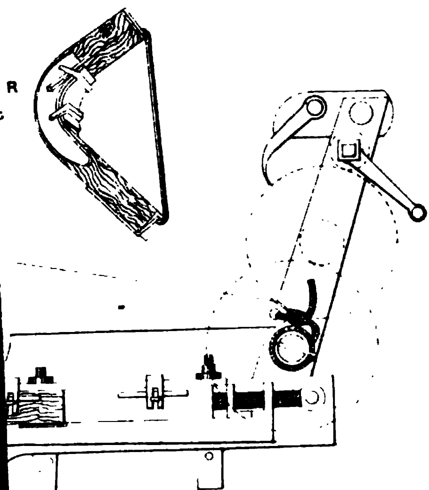


TION OF MACHINE

E BENDING HAS TAKEN PLACE.

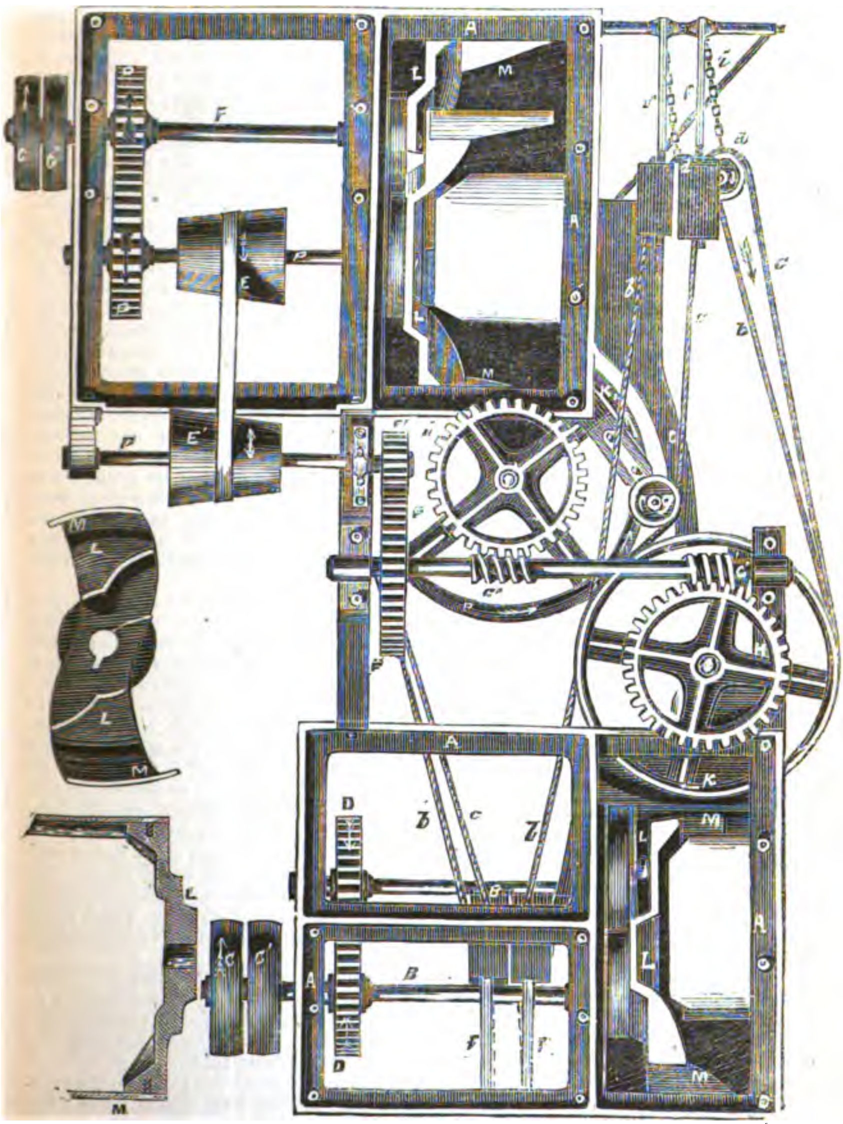
Standidge & Co. Litho. London.

Mechanics' Magazine.

No. 1745.] SATURDAY, JANUARY 17, 1857. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

MC BRIDE'S PATENT FLAX-SCUTCHING MACHINE.



MC BRIDE'S PATENT FLAX-SCUTCHING MACHINE.

MR. W. CARDWELL MCBRIDE, of Armagh, whose first patent machine for scutching flax, &c., was very successful, has brought forward an improved machine for the same purpose, Messrs. McAdam, of Belfast, being the manufacturers. A recent number of the Journal of the Society of Arts contained a communication from Mr. Edward Trent, of the Park Hemp Works, Old Ford, respecting this improved machine. He says: "Having made a careful trial of it during two days, I felt convinced that it was one of the most important movements yet made in the flax trade: and it is now my deliberate opinion that, by means of this machine, it will be possible to prepare and dress flax fit for the English market in any quarter of the globe where the plant can be grown, without regard to the unskilfulness of the inhabitants. The vast quantities of flax straw now thrown away in India could, by the above invention, be made productive of a profit that would induce cultivators generally to secure the same benefit, and if the vast capabilities of that magnificent but much neglected part of our possessions were developed, even as regards flax, thousands of tons might annually be produced, that would materially augment the wealth and comfort of the producers and the manufacturers. This improved scutching-machine is less expensive, more simple, more easily managed, and occupies less space and power than did the first machine, although doing fully as much work; it is perfectly self-acting, merely requiring the flax straw to be put in at one side, and the flax, finished, taken from the other side. All clasps or holders for fastening the straw are dispensed with, the attendants are not liable to accidents, and the important object of security from the annoyance of dust is attained, which is so injurious to the health of the workers; for, by simply elevating the machine a few feet, the whole of the tow and the scutching dust pass away beneath, so that, from witnessing this trial, I feel convinced, by the clean fibre yielded, and the small quantities of tow and waste left, flax can be scutched with quite as small amount of loss as by the most careful handling of skilled scutchers, which shows the great advantage of using McBride's machine, whereby unskilled labour, at 10d. or 1s. per day, does twice the work of skilled hands at 2s. to 3s. 6d. per day, and the machine can be easily set, so as to dress either green or unretted straw, as well as either cold or hot-water steeped. Messrs. McAdam and McBride, in their own statement of performance of the machine, modestly put down 500 lbs. of fibre cleaned in a day of ten hours; but the result of the two days' trial I witnessed gave us, on the first day, 800 lbs. of clean fibre, or an average from each cwt. of flax straw of 30 lbs. clean flax; but on the following day, with increased speed, 900 lbs. were produced in ten hours, on an average of 29 lbs. flax from each cwt. straw; yet, by the present expensive mode of hand-scutching, from 20 lbs. to 22 lbs. is reckoned a fair yield from each cwt. of the straw, showing most strikingly the great advantages derivable from McBride's new machine."

The improved scutching-machinery consists of two parallel shafts, with arms on each of them, which arms are of greater length than half the shafts are apart, so that in revolving they form two intersecting circles, or, as it were, overlap each other. To the extremities of these arms are fixed beaters or scutchers fastened to the arms by one end, and as nearly as may be at right angles to the arms, or parallel to the shafts. There are two concave surfaces (stocks), one placed opposite to each set of beaters, exterior to one set and interior to the other, and at sufficient distance therefrom to leave room for the flax (or other fibrous material acted upon) to pass between them. A partition may or may not be placed within the double convex space formed by the intersection of the two sets of beaters. The two shafts revolve in opposite directions, that is, towards each other, and are so placed that their beaters shall pass each other, striking the flax on opposite sides alternately, the flax being held outside the point of intersection of the beaters, and at this point the beaters draw it under their action, alternately striking it on opposite sides. In the case of the intermediate partition being used, the beaters will draw the flax alternately to each side of the partition. A shield may or may not be placed inside the edges of the beaters, adjustable to suit different qualities of flax or other fibre. The fibres are held by the apparatus which formed part of an invention for which letters patent for England were granted to Mr. McBride the 31th June, 1852.

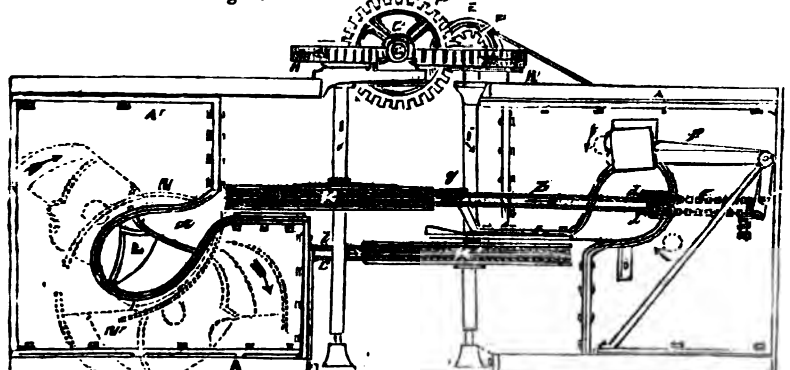
Fig. 1 of the accompanying engravings is a side elevation, and fig. 2 a plan of a double scutching-machine constructed according to the present invention. It may be here remarked that although Mr. McBride recommends double mills to be used, as operating upon the fibre in a more quick and economical manner, yet, where desired, a single machine may be employed. A A is the general framework; B B′, the scutcher-shafts, one of which, B, is furnished with fast and loose pulleys, C C′; D D are toothed wheels keyed on the shafts, B B′, whereby equal motion in a contrary direction is imparted from B to B′; E is a friction cone on the shaft, B′, which communicates motion through a belt and similar cone, E′, to a shaft, F, on the inner end of which is keyed a toothed pinion, F′, which gears into and drives a toothed wheel, F″, upon a shaft, G, which has keyed to it two endless screws, G′ and G″. The screw, G′, gears into and drives a worm-wheel, H, keyed on the upright

shaft, I, to which is also affixed the holding grooved wheel or pulley, K, for machine No. 1, while the other screw, G″, gears into and drives a worm-wheel, H′, keyed upon a similar shaft, I′, to which is also affixed a similar holding grooved wheel or pulley, K′, for machine No. 2. L L are arms affixed to the inner extremities of each of the scutcher-shafts, B B′; and M M are curved beaters or scutchers fixed to the arms. The arms and beaters are shown detached in figs. 3 and 4, which are respectively front and sectional elevations thereof. The shafts, B B′, are geared together in such manner as to cause their respective beaters or scutchers to act alternately and successively upon the fibre to be scutched; that is to say, supposing one beater of shaft B to have acted on the fibre, one of the beaters on shaft B′ next comes into play, then the second beater on shaft B, and finally the second beater on shaft B′, and so on regularly. To the sides of the scutching-chamber frames, A′ A″, and extending across them to an extent equal with the length of the beaters, are attached two curved stocks, N N′, shown in dotted lines in fig. 1, machine No. 1, one above and the other below the feed openings, *a*, in the sides of the scutching-chamber. Each of these stocks is interior to one and exterior to the other set of beaters—that is, the outside of the beaters on the shaft, B, is presented to the inside of the lower stock, N′, and the outside of the beaters on the shaft, B′, to the inside of the upper stock, N, whereby the fibres held and fed, as hereafter described, are scutched on both sides.

The holders which, as before stated, are similar to those previously patented by Mr. Mc Bride, consist of grooved pulleys or wheels, endless bands, tension levers, and pulleys to keep the bands tight, and directors or guides. K is the grooved pulley for machine No. 1; *b c*, two endless bands or ropes passing round it, and around two tension pulleys, *d d*, connected by chains, *e e*, to two weighted crank levers, *f f*; *g* is a guide pulley. The grooved holding pulley, K, for machine No. 2 is placed on a lower level than that for machine No. 1, and is provided with similar bands, or ropes and tension apparatus.

The action of the machinery is as follows;—Motion having been communicated to the scutchers and holding pulleys through the fast pulleys, C C, and the gear hereinbefore described, the fibre (and we will suppose that fibre to be flax), is fed into machine No. 1

Fig. 1.



by being inserted between the endless ropes, *b c*, and the holding wheel, K. The flax is nipped just above its mid length, and carried forward in the direction of the arrow shown on the wheel in plan, fig. 2, into the scutching-chamber, where the beaters or scutchers scutch that end of the flax which the wheel has introduced over the under stock. The fibres undergo the scutching operation until, by the rotation of the holding wheel, they are withdrawn from the scutching-chamber. Guides, not shown in the engravings, assist in directing the flax forward in its proper position; and just previously to the holding wheel and ropes ceasing to grip the flax, the hanging and scutched end is caught by the ropes and holding wheel of machine No. 2. The unscutched end is guided over and on to the under stock in machine No. 2, where it is operated upon by the beaters in this machine until it is carried by the revolution of the holding wheel and ropes out of the scutching-chamber. As soon as the ropes and wheel cease their grip on the flax, an attendant removes it scutched throughout from the machine at the side opposite to that at which it entered.

In some cases, where flax requires harder scutching at one end than at the other, the size of one of the fast pulleys is altered; ordinarily both sets of beaters are driven at the same speed. Again, in the scutching of soft fibre, to prevent the edges of the beaters from injurin it, the patentee applies shie ds to them.

THE GREAT WAR INVENTION.

OUR readers will recollect, that by a recent decision of the Lord Chancellor, permission was granted for the completion of Mr. Macintosh's patent for a new method of carrying on offensive and defensive wars, the granting of which patent was opposed during the recent war by the Board of Ordnance, at the instance of Lord Panmure, on the ground that the publication of the invention might lead to the employment of it against us by the Russians. It will also be recollected that, during the war, rumours were abroad to the effect that the Government had in contemplation the introduction into the army and navy of some terrible agent, and the use of it on a large scale against the Russian fortresses. As the war has now ended, and the official publication of the invention will take place in the course of a few weeks, no reason exists for further delay in making it known, and we therefore propose at once to place an account of it before our readers. Its perusal will be attended with the pleasant reflection that, whatever efficacy this new form of warfare may possess, there is no country so well stocked as our own with the material which constitutes the principal agent employed.

The invention consists in methods of facilitating attack on stronghold batteries on shore, and on fleets, dockyards, harbours, towns, and other objects; and in methods of defence against the approach of an enemy. When it is desired to attack fortresses from seaward, the inventor generates by chemical means an artificial dense and dark fog or atmosphere, capable of being prolonged at pleasure in front of the batteries or forts to be attacked, the result of which fog is to drive the enemy from their guns, and enable the attacking vessels to approach the enemy's works, and take up the positions necessary for pouring in their broadsides, unmolested by any hostile fire.

In order to carry out the invention, he takes coal-tar naphtha, alone or in combination with other materials, and causes the same to be conveyed to a hostile stronghold, naval battery, or fort, by the following means: In attacking the sea faces of such strongholds or fortifications as Cronstadt, Malta, or Sebastopol, where there is scarcely any tide, but a sufficient depth of water, he freights with the before-mentioned materials submarine steam vessels, or vessels rendered shot proof, having iron compartments or tanks specially adapted for containing the same, and despatches them to the enemy's works, in front of which, by means of pumps, hose, and suitable outlets, a sufficient quantity of the composition is discharged upon the surface of the water surrounding or bordering the fort or battery. He then places a ball of potassium in the entrance of the tube or hose, by means of suitable cocks or taps, and renews the pumping, so as to force the ball of potassium through the tube into the water, when, by its great affinity for oxygen, it will immediately take fire on rising to the surface, and inflame the entire quantity of composition previously transmitted. The consequence is the formation of a dense, black, suffocating fog or vapour, which envelopes the fort or battery, rushing into the casemates or embrasures, and driving away the gunners and all engaged therein. He keeps up the supply of the composition for a sufficient period, so that the attacking vessels can approach sufficiently near to destroy the enemy's works, already rendered untenable and incapable of resistance. Fortresses such as the above-named are to be rendered harmless by this process, and destroyed without loss of life to the attacking vessels.

Another mode adopted by the inventor is as follows, (it being understood that the operations take place from a vessel appointed for the purpose among those about to attack the fort or battery): He takes a hose or tube of suitable material, rendered impervious to the action of naphtha, and coils or winds it upon a drum, or disposes it in any other suitably compact form, capable of being readily paid out from a shot-proof steam vessel in which it is placed. One end of the tube or hose being retained in the vessel from which the operation is to take place, the shot-proof steam vessel proceeds to the enemy's fort or battery, paying out the tube or hose as it progresses. When the tube is thus conveyed sufficiently near to the hostile fort or battery, its extremity is sunk to a suitable depth by means of weights and cords, which secure it from change of position, and the vessel returns to a situation of safety, while, by means of a force-pump, the operators cause the composition or mixture before-named to flow from the vessel appointed for the service through the tube. The consequence is that the composition issues from the end of the tube in close contiguity to the enemy's fort or battery, and by its less specific gravity rises to the surface of the water, whereon it floats. The ball of potassium is in due course to be transmitted, in order to inflame the whole, as before described, and the supply is continued as long as desired. Under tidal influence the tube may be

attached to a boat, or other buoyant object, and allowed to float to the battery or fort intended to be attacked. Or the composition may be discharged upon the water and allowed to be carried by the tide or wind to the battery, and then ignited by a shell containing naphtha and potassium, or by a rocket containing potassium, or by other suitable means.

By the foregoing method the tube or hose may be laid down at night, or in a fog, or at some other suitable time, the attacking fleet having always the advantage of choosing wind and weather, and of selecting those opportunities and positions which are alone needed to develope its formidable powers. It may be expedient, under certain circumstances, to freight a steam vessel with the combustible material, and to start her under the control of two or three men towards the enemy's works; when nearly within the enemy's range they light a time fuse in connection with gunpowder, and abandon the vessel, leaving her to proceed on her course and reach the enemy's works. The consequent explosion scatters and disperses the composition, and causes the combustion of the whole, creating the destructive effects previously described. In order to support the combustion of the composition in contiguity to the fort or battery, the neighbouring atmosphere is deprived of its oxygen, and, to continue the combustion, oxygen is derived from the windward side, and the flame and heat rarify the air to such an extent, that cold or fresh air cannot descend; consequently, the battery or fort, being to leeward, becomes completely enveloped in nitrogen, the result of which is to drive the enemy from their guns, and enable the vessels of the attacking fleet to approach, take up the most desirable positions, and pour in their broadsides unmolested.

Another feature of the invention consists in filling diaphragm shells having a bursting charge with coal-tar naphtha, with the addition of a few pills of potassium, which shells, when fired in the ordinary manner, possess the following properties and advantages over the ordinary shells:—Striking against the walls or surfaces of a stronghold, battery, or naval fortress, these shells may either break in pieces by percussion, or they may fall into the sea without fracture. In the former case the naphtha and potassium become scattered and fall on the surface of the water, the potassium igniting the whole. In the latter case the shell sinks, and in due course explodes in the usual manner: the naphtha and potassium then rise to the surface, and become ignited, causing the destructive results before described. But should the shell enter the casemates or embrasures, or any part of the fortress, the result is as follows:—If the shell is fractured by concussion, the naphtha becomes scattered in all directions in the interior of the battery, causing the whole atmosphere to become highly explosive, by the diffusion of hydro-carbon gas; and, should flame be present, an explosion results, causing destruction to gunners and material. But if the shell should not have become fractured by concussion, the bursting charge explodes in due course, and scatters the naphtha with similar results. This shell, when fired into combustible material, possesses the most destructive properties.

Another portion of the invention consists in mixing with coal-tar naphtha, India-rubber, gunpowder, and fibrous materials, and in filling therewith carcases and diaphragm shells having a bursting charge. These shells are for the purpose of setting fire to combustible materials; and, when fired and burst, the thick fibrous material prevents the diffusion or scattering of the mass, which becomes inflamed, and burns with fearful energy, causing destruction to all combustible matter within its influence. The inventor fills diaphragm shells with coal-tar naphtha, mixed with phosphorus and bisulphuret of carbon, or suitable phosphuretted paste, such as is usually employed in the manufacture of instantaneous lights, having a bursting charge sufficient to open the shells. When fired, the bursting of these shells scatters the contents in all directions, and the shower of inflammable material falling among cavalry and troops, ignites spontaneously, causing their immediate disorganization and destruction. Fired into shipping, these shells bursting on deck or below, scatter inflammable material in all directions; and the spontaneous combustion which arises, causes inevitable and irremediable injuries and destruction to the crew, who are unable to escape, except by dropping overboard. The vessel itself is speedily consumed, aid from the crew having been rendered impossible, as just described. Fired into harbours, dockyards, or towns, the result is alike destructive and decisive.

The inventor also fills the shells or carcases attached to rockets, with the foregoing compositions. He also applies his inflammatory composition to rockets in the following manner:—He takes gunpowder and mixes it with coal-tar naphtha, and India rubber, and, if desired, with fibrous materials; the mass is now pressed, and formed into moulds of a size to fit the rocket shell, either in the form of separate washers, or in a complete tube or cylinder. The mass may be moulded or pressed at once into the rocket shell, having a mandril

in the centre. The object of this method is to render the powder impervious to moisture, to cause adhesion of the mass, which prevents it from cracking, and to carry fire to an enemy, in which case the internal surface of the rocket is coated with gunpowder, India rubber, and fibrous material, which become ignited after the rocket has reached its destination, causing destructive results.

The inventor also applies his inflammatory materials to the manufacture of fuses for shells, by mixing gunpowder, India rubber, and naphtha, and forming the mass into fuses; by which means the preservation of powder from damp and wet is effected, the fuses are easily ignited, and burn with great regularity, and they appear absolutely incapable of being extinguished—qualities which render them of great service in ricochet practice.

In the defence of fortresses, towns, harbours, dockyards, shipping channels, and mouths of rivers against the attack of a hostile fleet, as well as in repelling troops landed therefrom, the inventor makes use of any of the means described in the modes of attack, according to circumstances.

For example, to convey the inflammable materials to a hostile fleet he employs submarine vessels, having propelling power, and furnished with iron compartments or tanks as before described, whereby he is enabled to discharge, by suitable outlets, a sufficient quantity of material directly under the enemy's vessels. He then allows a ball of potassuim to rise to the surface, which, igniting amongst this inflammable material, instantly engulphs the fleet in flames and black suffocating vapour, speedily destroying life and material without risk to the submarine vessel.

The several shells described in the means of attacking an enemy, may be also made available for destroying a hostile fleet. The shells filled with the composition capable of becoming spontaneously ignited, form a certain and awful agent of destruction when employed against an attacking or advancing force landed from an enemy's fleet.

The compositions described will burn as well in mud as in water, and when a shell containing them bursts in mud or earth works, the bursting of the charge ignites the inflammable material, and the earth, being porous and incombustible, prevents the combustion from spreading rapidly, but allows the black vapour to ooze out gradually, causing most serious annoyance to the enemy, who are utterly unable to extinguish the suffocating fog, and are hindered from carrying on their operations.

The invention may be brought to bear, with satisfactory results, against an enemy encamped in tents, and surrounded with materials of warfare, by opening fire upon them with the rockets and shells, especially those containing the spontaneously igniting composition, the result being a general conflagration, and destruction of men and material, transforming the whole into one vast sea of fire.

In defending a fortress or town from the attack of an enemy by land, the inventor causes ditches to be formed around the same at a distance beyond range. In or near the town or fortress, he keeps a quantity of coal-tar naphtha, or composition, as described, in suitable reservoirs situated on an elevation, so that, by means of mains or pipes with branches in various directions, laid down from such reservoirs to the ditches, a powerful head or flow is always available for supplying the inflammable material, and rapidly discharging the same into the ditches in the event of an enemy endeavouring to cross the same. By the ball of potassium, or by a shell, the whole is inflamed, causing destruction to the enemy.

In stopping the passage of an enemy crossing a river by the aid of boats or pontoon bridges, the inventor allows the enemy to construct their bridge, and permits any desired number to cross over, and being thus divided, he causes a quantity of the material described to flow into or upon the river and among the pontoons. The material or composition being inflamed by any of the foregoing methods, the pontoons are, with the advancing troops, instantly engulphed in devouring flames, with black suffocating vapour, and speedily consumed; in addition to this destruction, the enemy become divided beyond all hope of reuniting, and the advanced portion thus cut off from assistance or retreat, fall into the hands of their opponents. Should there be a current in the river the material may be discharged accordingly above or below the pontoon bridge, and allowed to float or drift thereto, and being then inflamed by any of the methods described, the rapid destruction of men and material ensues.

In preventing the passage of a hostile fleet through narrow channels, suitable reservoirs containing the material or composition are placed at elevated positions, and mains with branch pipes are laid down to the channel at various distances apart, and the hostile fleet being allowed to enter to any desirable extent, the material may be discharged and inflamed, so as to cause the fleet to be placed between two fires, not only putting a stop to its progress or retrogression but overwhelming the crews with the black suffocating fog or vapour, and eventually, on the burning mass arriving from one direction or the other, according to wind or current, causing its inevitable conflagration.

From the nature of the country or other cause it may not be convenient to place the reservoirs on elevated sites, in which case the material is to be forced by mechanical means from the reservoirs, and caused to flow with great rapidity through the mains and pipes.

When the destruction of an enemy's vessels is not desired, the hostile fleet is permitted to enter a channel, or to take up any position chosen for its attack; the inflammable material is then discharged and ignited at moderate distances from the various vessels composing the fleet, precaution being taken so to regulate the supply that, while the flames are not suffered to acquire a sufficient magnitude to approach and injure the vessels, the black fog enshrouds the fleet in impenetrable continuous darkness, their crews being simultaneously destroyed by the stifling vapour. The operation being completed, the atmosphere is allowed to regain its natural purity, and possession of the fleet may then be obtained.

In preventing attack from steam-floating batteries, which, being encased with iron and rendered shot-proof, are considered impregnable, the various methods of defence before described may be adopted, and although by reason of these vessels exposing but little combustible material externally, they may not sustain important injury from the burning material; yet the circumstance of their being deeply immersed for the purpose of affording a less conspicuous mark to an enemy is extremely favourable to the operation of the invention, as the operators are enabled the more rapidly to envelope them in dense clouds of black vapour, instantaneously overwhelming and destroying their crews. The downward furnace draught existing in steam vessels towards the boiler and engine rooms greatly facilitate the effect of the foregoing operation; the black suffocating vapour is instantly drawn down to those situations, destroying the engineers and firemen, and rendering any attempt on the part of the fleet to escape impossible.

Land batteries furnished with well served long-ranged guns, firing the Macintosh shells filled with combustible material, would effectually protect a town or harbour from the attack of an enemy's fleet, or even a few shot-proof vessels having well-served guns, firing such shells would not only keep a hostile fleet in check, but scatter on the vessels a vast shower of burning material, causing a general conflagration.

When it is desired to check the passage of troops through mountain passes or defiles where there is an absence of water, the inventor employs cotton, wool, or other suitable fibrous material, which he places in various situations in the pass, and lays down some flexible hose thereto from an elevated position whereon a supply of the inflammable material is reserved. By these means, when the enemy attempt to force or effect their passage, he saturates the fibrous material with the composition, and inflames the whole by means of a voltaic battery, or other suitable method; the fibrous material acts as an immense wick, and causes the naphtha to burn with terrific effect, creating a vast black fog in the defile; or he saturates the ground with the naphtha without the agency of the fibrous material, the supply being maintained at pleasure. The enemy being thus enclosed between the sides of a mountain pass or ravine—a situation where, under the operation of the invention, the access of pure air is rendered impossible—the atmosphere is at once deprived of its oxygen, and the troops suddenly enveloped in nitrogen, sink powerless to the earth under the irresistible influence of this appalling agent of destruction, and perish suffocated in absolute darkness.

The inexpensive and expeditious method by which large quantities of coal tar naphtha can be had from gas works, and the lengthened period during which it can be preserved without deterioration, together with the safety and facility of applying it, are very favourable circumstances in connection with this invention.

TONNAGE REGISTRATION, ETC.

The letter of "Veritas," which we inserted a fortnight ago, and Mr. Atherton's note in reply, which appeared in our last Number, seem to require a few words of explanation on our part. Mr. Atherton's very sanguine disposition appears to have induced him to discover a far greater amount of concurrence between his views and ours than the discussion or any "explanation" of ours warranted. For the character and good intentions of that gentleman we always entertained a high regard, and did not wish to pursue him with anything that might bear the appearance of rancour. We must, however, remind him and our readers that in no single instance did we recede from any of our published opinions, while the silence of Mr. Atherton on some points under discussion, and his modified tone on others, gave us reason to believe that the force of our arguments had not been entirely lost upon him. In order to preserve ourselves from the appearance of yielding, although not wishing to wound our opponent's feelings, we did from time to time point out that the approximation to anything like "common grounds of concurrence" had been on his part and not on

ours. In the hope that Mr. Atherton's opinions had received material modification, we abstained from comment on his letter of the 24th of September last, which we viewed in the light of a graceful retractation of the more prominent errors we had attributed to him, although we might easily have shown that in so doing he distorted our meaning. But content with the victory we had won, and not wishing to humble our adversary unnecessarily, we forbore. We were, certainly, very much startled at the use, or, to speak more correctly, the abuse of our remarks on tonnage registration, relying on which Mr. Henderson claimed the Editor of the *Mechanics' Magazine* as a supporter of the views of the agitators, and so strengthened his application to the British Association for the re-appointment of the Tonnage Committee. We think the remarks of "Veritas" quite justified on that head; and although at the time we abstained from any comments on Mr. Henderson's proceedings, as it did not seem to us worth while to re-open the question, we now feel it our duty to signify our approval of the comments of "Veritas" on Mr. Henderson's course, and to say for ourselves that, by omitting important qualifications, and by removing isolated passages from their context, that gentleman succeeded in representing us as putting forth opinions in almost all cases the exact reverse of those which we had maintained, and do still maintain.

Mr. Atherton has since re-opened the question by a letter to the *Times*, to which Dr. Woolley, as a fellow-member of the Committee, has replied. We regret to observe, from the general tone of Mr. Atherton's remarks, that he has not made that progress in approximating to sober views on this question for which we had given him credit. It appears from Dr. Woolley's letter that the Committee have not yet come to any decision, or agreed upon any report. This being the case, we suspend for the present any further discussion of the questions at issue. We thought it right in September last, considering the part we had taken in the discussion, to point out to the Committee the course of action we considered it incumbent on them to pursue, in order to ensure an impartial deliberation and decision. We then stated our satisfaction at observing that, in the list of that Committee, the names of several men of eminence in the shipbuilding and engineering world, and of others eminent for scientific ability, were included. And although probably the pressure of business avocations may not permit them to take so large a part in the previous discussions as the agitators, we trust their influence will be felt in the composition of the Report. We do not wish to interfere by any remarks of ours with the free and unfettered action of the Committee, but shall reserve all further discussion until their Report has appeared, when we shall not shrink, if necessary, from expressing our full and free opinions on the whole question.

TIMBER-BENDING MACHINERY.

It is unnecessary for us to inform our readers that the bending of timber is an operation which has hitherto been performed as rarely as possible, and always with very considerable trouble and expense. Every ship-builder knows perfectly well that the expenditure of time, labour, and material involved in bending a thick plank round a bluff bow, or round a quarter is enormous, and knows further that the impracticability of bending very thick timber at all, leads to fearful waste. At the same time, furniture makers and other workers in wood are well aware that a cheap and efficient method of giving circular, oval, and other curved forms to wood on a smaller scale, would be invaluable.

It is therefore with pleasure we are enabled to state that Mr. T. Blanchard, of Boston, America, has invented, and that a highly respectable English Company has been formed to carry out a new and excellent mode of bending timber of all kinds and dimensions, and into any required forms, within reasonable limits. The plate at the beginning of this Number represents the improved machinery, the action of which will be understood sufficiently for all ordinary purposes, without any more detailed description than the illustration contains. We have seen timbers of large dimensions bent (after having been suitably steamed), with the greatest facility, at the works of Messrs. Collinge and Co., patent hinge manufacturers, Westminster-road, Lambeth. The characteristic feature of the apparatus is that it subjects the wood during the bending process to pressure on all sides, by which it is prevented from bursting, crippling, or altering its form in any other than the desired manner. The *set* imparted to it becomes quite permanent after a few hours, during which it is kept to its form by an enveloping band and a holding bolt. A subsequent examination of the bent timber, sawn into slices, was most satisfactory.

It is highly gratifying to observe that the machinery for the working of which the new company has been formed, has received the unqualified approval of many persons whose opinions are not lightly pronounced. Mr. W. Fairbairn, says: "As President of

the Jurors of Class 6, at the Paris Universal Exhibition, this invention came under my own immediate inspection and that of the gentlemen composing the jury of that class; and from the specimens there exhibited, and the experiments made in a working model, I am of opinion that this invention is destined to effect an entire revolution in the formation of timber requiring curvature of form." Mr. G. Rennie bears similar testimony. Mr. T. White, of Portsmouth, in speaking of the bending process, says: "The effect is *perfect;* the grain of the wood is not disturbed in the least, and in ship-building will be invaluable." Mr. J. Jarvis, United States' Government Inspector of Timber, writes of the invention in the warmest possible terms. He says: "The navy and merchant marine will be so much benefited by the use of this invention that we no longer miss the loss of our forests of white oak, for we can now bend young trees, not waiting their growth, into curves, which, when obtained so much across the grain, diminish the strength at least seventy-five per cent. Our cabinet-makers will be able to get all the curved pieces without compressing the piece cross-grained, as hitherto done. I have been an inspector and measurer of timber in the navy yard for upwards of forty years, but no invention so important as the one under consideration has ever come to my knowledge in reference to the improvements in ship-building." An English architect, Mr. Charles Mayhew, writes: "I have carefully examined the various specimens of timber bent by your machine, and have much pleasure in stating that I consider it one of the most useful and ingenious inventions I have ever seen, and must 'go a-head' of all other methods at present introduced in this country, owing to its extreme simplicity—its applicability to any curvature—and its capability of bending into a permanently set form any wood up to 16 inches square, however hard, not only without injuring its fibres, but positively rendering the wood more rigid, and, at the same time, increasing its strength to such an extent that, in a structural point of view, I am of opinion that, in many cases, it will supersede the necessity of using iron."

It is satisfactory to observe that when a really good invention, like the one before us, is introduced to the public notice in this country, it is sure to receive its due praise, without regard to its origin. Although an American invention, the English press, including the scientific portion of it, has given unstinted approbation to Mr. Blanchard's machinery. The *Builder* says: "The difficulty which at present exists in procuring timbers for ship-building of a natural growth suited to the forms required for knees, futtocks, &c., will be overcome by this invention; and, for purposes of furniture, &c., the saving of material (often of a very costly nature) must, we should think, insure its adoption by the trade."

It should be remarked, that the results of a series of experiments made at the Novelty Works, New York, under the inspection of Mr. Delano, Naval Constructor of the Government Dockyard, Brooklyn, to test the relative strength of natural and machine-bent knees for ships, proved, according to the *Scientific American*, decidedly in favour of the machine-bent knees.

A Geometrical Treatise on Conic Sections, for the Use of Schools and Students in the Universities. By Rev. T. Waddingham, M.A., late Fellow of St. John's College, Cambridge. London: Longman, Brown, Green, Longmans, and Roberts. 1857.

Some few years ago, geometry had almost entirely gone out of fashion in our universities, and, of course, in all other places of instruction. Analytical—that is, algebraical—methods were exclusively preferred wherever they could be found. The consequence was, that the knowledge of the greater part of students was very unsound, and almost valueless. The methods in vogue were applied to the solution of the several problems required, with little or no perception of their meaning. The analytical process was a mere machine; and when the conditions of the problem had once been reduced to an algebraical statement, the student put it into the machine, and passed it through the several processes until the final answer came out, with pretty much the same amount of intelligence as turning a handle requires. It is true that the few gifted with the higher faculties of mathematical perception acquired more power by the prevailing system than any amount of geometrical investigation could possibly have bestowed on them. But it was rightly felt that, for the purposes of education, the interests of the many, and not of the few whose progress is little affected by particular systems, should be consulted. Geometry was, therefore, brought back again to our places of study, if not in the full plenitude of its ancient exclusiveness, yet to the exercise of some considerable control over the labours of mathematical students.

Geometry never can at all compete with analysis, as the instrument either of research, or of putting the learner in possession of the results of research. The mathematician must, therefore, always acquire considerable powers of analysis; he cannot on any other terms become a mathematician.

But even he will gain something worth consideration by being inured also to the methods of geometry. In every science, however, the class of problems which fall within the range of geometry is very limited; and geometrical treatises can never be full and comprehensive, and must always be looked upon rather in the light of educational works than of set treatises.

We have always been very much inclined to doubt whether the properties of that class of curves called the conic sections were a very fit subject for the strict application of the geometrical process. The solutions of a considerable number of the problems which present themselves in this branch of science, although exhibited under a geometrical guise, are nothing more than algebra in disguise; while the almost endless series of ratios to be compounded in many of these solutions can present no definite ideas to the student, are a mere exercise of memory, and are wearying and disgusting in the extreme. A judicious mixture of geometry and analysis—such as was to a certain, though perhaps not to a sufficient extent, attempted in the treatise of Dr. Hymers, which was the favourite text-book at Cambridge fifteen or twenty years ago—seems to us the most suitable for an educational treatise on conic sections. The fiat has, however, gone forth, and at Cambridge, and, by consequence, at innumerable preparatory seats of learning, a certain definite number of properties of the conic sections *must* be solved by the geometrical process. The imperfections, therefore, which are inseparable from an exclusively geometrical treatment of these problems are not fairly chargeable on the authors who have been driven to write treatises under this condition, but on the too great violence of the reaction from the analytical to the geometrical methods.

Mr. Waddingham's treatise seems as unexceptionable as the nature of the task he has set himself to perform will admit. He early adopts for his geometry a system of symbols which bears a wonderful resemblance to algebra, and thus divests his work of much of the repulsiveness which, for the most part, characterizes geometrical treatises on conic sections. But the inherent inflexibility of geometry, which entails the adoption of roundabout methods and interminable series of ratios, especially the impossibility of representing in this science the division of a line by a line, no art can surmount. By way of example, take the proof of the elementary property of the ellipse—that the focal distance is to the distance from the directrix as the distance of the focus from the centre is to the semi-axis major. This not only requires the measurement of a line on the axis major equal to the focal distance, but also *seven* lines of ratios! In analytical treatises this property is generally assumed as the definition of an ellipse, viz., that it is a curve such that the distance of every point in it from a fixed point (the focus) is to its distance from a fixed straight line (the directrix) in the ratio of $e : 1$, where e is <1. Again, the elementary proposition that

$$PM^2 : AM.\ MA^1 :: BC^2 : AC^2$$

requires *sixteen* lines of ratios for its proof!

One of the most glaring defects of the geometrical mode, besides the miserable want of comprehensiveness, is the difficulty, almost amounting to impossibility, of maintaining anything like uniformity in the treatment of the several conic sections. Of course, this remark does not apply to the ellipse and hyperbola, but to the parabola as compared with these two. In all analytical treatises the relation which these curves bear to one another is clearly seen in the definitions, whether they are considered as the *loci* of points which possess certain properties, or as the ultimate forms which the general equation of the second degree must assume when properly reduced. There is no such relation generally maintained in the geometrical treatises. Thus Mr. Waddingham defines the parabola as "the curve in which the distance of any point from a given straight line is equal to the distance of the same point from a given point." The ellipse, according to his definition, is "the curve in which the distances of any point from two given points are together equal to a given straight line," and "the hyperbola is a curve in which the difference of the distances of any point from two given points is always equal to a given straight line."*

Another inherent defect of the geometrical method is the difficulty of treating the doctrine of contacts. Mr. Waddingham, for example, defines a tangent to a curve to be the limiting position which a secant through a fixed point in a curve approaches when the second point through which it passes moves along the curve up to the fixed point. There is no objection to the logical correctness of this definition, or to the legitimacy of the processes by which the properties of the tangents to the several conic sections are deduced. But it must be borne in mind that the conception of the doctrine of limits, especially of the geometrical method of exhibiting it, implies the possession of considerable powers of abstruse thought; and considering the class for whose special benefit the methods of geometry have been recalled, we doubt very much whether one in a hundred of them ever attains to anything like an adequate notion of what is meant. After a certain amount of effort to

master the difficulty, it is taken for granted, and off the student goes again. The analytical mode of pursuing the same investigation is, we believe, far more intelligible to the great bulk of students; and that mode of investigation which is made to depend on the locus of the middle points of a system of parallel chords is more unexceptionable, as the peculiar difficulties of the doctrine of limits are therein almost entirely eluded.

These objections, our readers will perceive, lie against the method of an exclusively geometrical treatment of the properties of the conic sections, for which our author is not responsible. Having to conform to the conditions which this principle imposed upon him, he has succeeded well enough in his task; and to those who are required, or to those who wish to attain a proficiency in the geometrical mode of solving problems of this nature, we heartily recommend the treatise of Mr. Waddingham as among the very best that have appeared.

PATENT SMOKELESS FURNACES.

At a recent meeting of the Liverpool Polytechnic Society, held in the Royal Institution of that town, a discussion of considerable importance took place, respecting the novelty of certain furnace fittings. Several reports of what occurred have been published in various journals, but all of them have omitted the quotations which were made from the specifications of the opposing patentees, and upon which the whole interest of the matter rests. We have therefore prepared the following report, which contains the really important elements of the discussion.

The Report of the council for the past year was first submitted, in which the following paragraph occurred:

"Subjects appertaining to sanitary improvement have always been well received and thoroughly discussed at our meetings. Of these the question of the prevention of smoke is one of prominent importance. Its principles are now thoroughly understood, the mechanical arrangements requisite can be combined with certainty to effect the most satisfactory working results, and it is pleasing to record here that one of our members, Mr. Charles W. Williams, has been most successful and untiring in developing these means, and that last year the 'London Society for the Encouragement of Arts, Manufactures, and Commerce,' awarded to him the golden medal for his 'Essay on the Prevention of the Smoke Nuisance.'"

The public business of the evening included a description of

Mr. Simon O'Regan's Patent Smoke Prevention Furnace.

Mr. O'Regan, who had a variety of models and diagrams, showing the construction of his furnace, bridge, chill bars, joggle bars, &c., and also his marine steam boiler, with vertical tubes, stated that, after much experience and many experiments, he saw that an entire change was necessary in the construction of the old furnace, and thereby, by an ingenious but simple contrivance, to arrange a well-regulated supply of rarified air to the gases, causing immediate combustion, and the total prevention of smoke. To accomplish this, air was admitted through a chamber attached to the furnace door; the dead plate also admitted air through a series of slots; the fire-bars were moved by a joggle shaft, the waved bars longitudinally, and the intermediate or grooved bars or plain bars transversely. This movement joggled the burnt particles down between the bars, prevented the accumulation of clinkers, and their adhesion to the bars, and, by the admission of air, protected and preserved the fire-bars, while, at the same time, totally consuming the gases. Mr. O'Regan had been to Bolton within the last few weeks, where he had put up some of his furnaces for Mr. Hicks, the Government engineer; and after having tried his furnaces, superintending the trials himself, he was happy to say that Mr. Hicks recommended them; and he had been able to arrange that wherever that gentleman was consulting engineer, those furnaces should be introduced, and he had no doubt he would soon have them in use in all the Government works.

Mr. Charles Wye Williams said, there were undoubtedly some good things in what Mr. O'Regan had brought forward, but there was nothing new. Where were they to find Mr. O'Regan's claim but in the specification of his patent? It was no matter what assertions might be made: when his claim came to be tested, it was his specification that would decide the question. He would read three or four lines of Mr. O'Regan's specification, in his two patents of 1854 and 1856, which would at once show that what Mr. O'Regan professed to have invented was precisely what he (Mr. Williams) had been using for the last fifteen years. In the specification of his patent was the following:—"I first construct one or more chambers behind a hollow furnace bridge.......I then inclose from the top of the brick bridge downwards and backwards to the top of the chamber partition with a *perforated plate* placed at any convenient angle, thus forming a hollow bridge." Again—"In the lower part of the usual fire-bridge on the facing or opening to the ash-pit is an oblong air-valve, admitting air to the hollow bridge and air chambers when opened by the valve-rod.........The dead plate in front of the furnace is *perforated with holes* or slots, as is also the clinker plate." Again,—"The bridge is an iron casing faced in front with brickwork, and *perforated at back with small holes* for the escape of the air admitted by an air valve opening to the ash-pit." Mr. Williams then exhibited a similar perforated plate, taken from a boiler which had been many years in use. He pointed out that it answered exactly to the description in Mr. O'Regan's patent. This was the whole of the supposed invention. Take away the perforated plate, and the rest was of no value. Mr. Williams observed on what led him to the adoption of the perforated plates as air distributors. About twenty years ago, it was found that they could not dispose of the coals in the furnaces without making much smoke. The question occurred to him, why could not the gas given out by the coals be consumed in the furnace as in burners? Looking at an argand gas-burner, he asked what was the use of so many small holes? Why would not one do? He saw that if the gas issued through a single hole, there would be smoke; but if through many there was none. This suggested the use of *numerous orifices* for the exit of the air; on trial it was successful, and he then, in 1839, took out the patent. This was the foundation of the whole in theory and practice. Dr. Ure, on being consulted, said, "This is the true way of practically applying what we know is

chemically correct;" and he (Dr. Ure) himself revised the specification, which stated as follows: —"Having thus described the nature of my invention, and the modes of carrying the same into execution, I do not claim the introduction of air to the bridge, which has already been done by others: neither the plan of increasing the current of air by an artificial blast; *but I specially and exclusively claim as my invention, first, the use, construction, and application of the perforated air distributors, by which the atmospheric air is more immediately and intimately blended with the combustible gases generated in the furnace.*" Mr. O'Regan's second patent of 1856, was a still more palpable imitation, for he adopted the very terms. After describing his boiler, he adds, "In furnaces adapted to my improved arrangement of boiler, I construct behind the bridge an air chamber, having a perforated, or slotted metal plate, with a box to it, and thereby promote the admixture of the air and gases to favour ignition."

Mr. O'Regan here started up, and declared that Mr. Williams had no right to be present. He was not upon the card; and every word he had stated was false. (Cries of "Order.")

The Chairman (Mr. T. Edwards) expressed his disapproval of Mr. O'Regan's language.

Mr. Williams continued. The question was not one of feeling. It was a mechanical and scientific question. Was he not justified in saying that the public might use that plate without going to Mr. O'Regan? He wished Mr. O'Regan all possible success, but he had no claim to patent right in the matter: the patent had expired long since. The invention was then public property: the essential feature of it was the introduction of air to the furnace in *divided portions*. (Hear.) He had correspondence from many parts of the kingdom on this subject—from Bolton among other places. They had there put up furnaces on his principle, and they were successful. Mr. O'Regan, however, interfered, and told them they must not use these perforated plates; it was his patent, and he threatened to bring actions for infringing it. His answer was, "Go on using it. You have a perfect right to do so. Never mind Mr. O'Regan." In his essay he described Mr. O'Regan's patent as "An undisguised and identical, though unacknowledged imitation of the Argand furnace." Then, as to the corrugated bars, he had himself taken out a patent for such many years ago. Two models exhibiting Mr. O'Regan's plan of corrugated bars were here exhibited. These models, Mr. Williams observed, were twelve years old. But in practical effect these moving bars were of no use. Of the mode in which Mr. O'Regan proceeded, he would give an instance. A miller of this town had been fined by the magistrate, Mr. Mansfield for making smoke. Mr. Williams took some interest in setting him right, recommended his adopting the perforated plate to his furnace door; this was done, and the nuisance was abated. Mr. O'Regan, however, threatened him for the use of his supposed patent, and sent him the following letter:

"Messrs. Hull Brothers,—I beg to give you notice that I shall claim from you £16 for royalty, for infringement of my patent, which I find applied to your furnace-doors. And I now do claim the above, and beg to inform you that unless the same be paid to me forthwith, I shall place the same in the hands of my solicitor.

"SIMON O'REGAN."

Was not this seeking for money under false pretences? ("Hear," and applause.)

Mr Abraham.—What is the date of the letter?

Mr. Williams.—The 7th of May, 1856. Mr. Williams suggested to Messrs Hull a reply, and there was an end of the matter. Mr. Williams said he advised parties receiving such threats to take no notice of them. Every manufacturer might, for a few pounds, adopt the plan in his own furnace. The whole turned on the introduction of air in divided portions, the more numerous the better. There was the whole secret. (Cheers.)

Mr. Brown asked if cold air had not an advantage over warm, as containing more oxygen?

Mr. O'Regan said, the reason that all other applications of the principle had been failures was, that cold air was introduced. The cold air lowered the temperature of the flue and the furnace.

Mr. Williams said, the colder the air was the better, and no cooling effect could be produced if it was introduced by numerous small orifices. The idea of heating the air was a trick of patentees. It was the greatest possible mistake to speak of the advantage of hot air to furnaces.

Mr. Abraham confirmed Mr. Williams's opinion. The colder the air the greater the quantity of oxygen it contained, and so far it was an advantage. If they could get hot air equally condensed, it would be better; but as they could not do that, the balance of advantage was in favour of the cold air.

Mr. O'Regan said Mr. Williams was deluding the public, but he had not the honesty or the honour to tell the public so. The secret was in the box. The necessary quantity of air could never be introduced through the holes. The large opening at the top of the box let in the requisite proportion. Let Mr. Williams show him a furnace that had been working fifteen or even five years.

Mr. Williams would show him scores.

Mr. O'Regan said Mr. Williams had never published his treatise till he saw his plans.

Mr. Williams declared he had never heard of Mr. O'Regan or his plans till twelve months ago, though he had been using the perforated plates for a dozen years.

Mr. O'Regan said, if Mr. Williams claimed the perforations, he was willing to give them up. He would not use them.

Mr. Williams.—"Then if not necessary, why adopt them? By giving them up, he not only would wholly depart from his patent, as specified, but would fail in preventing smoke." Mr. Williams then observed that he had no interest whatever in the question, beyond that which every man in the community had, namely, the exposing the attempt to exact payment or royalty for the application of a principle which, having been in general use for fifteen years, was open to all the world.

Mr. M. Scott remarked, that the utmost Mr. O'Regan could claim for was a different application of the same principle as that employed by Mr. Williams. Now, to constitute a patent, there must be a new principle. Consequently, Mr. O'Regan's claim was void by the very meaning of the word patent.

Mr. Mondell requested Mr. Williams to give the society his opinion upon the perpendicular tubes.

Mr. Williams said, no doubt vertical tubes were good. They were first introduced about twenty years ago, by the father of Mr. Clark, who was present. At present, when using horizontal plates, they were made short, about three feet. Long tubes were the most mischievous things ever adopted. In the vertical tubes, however, the sediment fell down and choked them. The very last explosion, that of the Fire King, was one of vertical tubes. They were, however, nothing new. Mr. O'Regan had no more right to take out a patent for vertical tubes than for the perforated plate or the corrugated bars.

The Chairman observed that the first locomotive engine made at the Vauxhall Foundry was made with vertical tubes. Shortly afterwards Mr. Booth took out his patent for horizontal tubes.

Thanks were then moved to Mr. O'Regan for having introduced the subject, and in which Mr. Williams and others joined, as having furnished

the opportunity of exposing the attempted fraud of exacting money under the pretext of patent right.

SOLUTION OF QUARTZ.

The Australian papers just received from Melbourne report the discovery, by Count Dembinski, of a process by which quartz or silica is chemically dissolved, and all the gold, metallic oxides, and metals contained in it precipitated. His method is the following:—One part of quartz in small pieces is, together with two-and-a-half or three parts of carbonate of soda, brought to a red heat and melted. Cast-iron tubes are, perhaps, the best vessels in which this process can be done. Silicate of soda is now formed, deliquescent in air, and perfectly soluble in cold water, the carbonic acid of the soda being, of course, given off by the reaction. This silicate of soda is dissolved in water, in wooden vessels, and thus left for a few hours, during which time the gold and all other foreign substances contained in the quartz are precipitated. After the precipitate has been formed the solution of silicate of soda is, by means of a syphon, decanted into another wooden vessel, in which, by the inflation of carbonic acid, the soda is separated from the silicic acid, and regained as carbonate of soda. By decanting it again and evaporating the water it is made fit for another dissolving process. He obtains the carbonic acid, which is used for regenerating the soda, from the same fire which he makes use of in combining the quartz and soda. This he does by employing the well-known centrifugal air-pump, and follows up in all particulars the method of Melsens in the decomposing of saccharate of lime. By inflating carbonic acid into the solution of silicate of soda he separates the silicic acid from the soda. This latter remains in water, the silicic acid has been precipitated in the form of a transparent, nebulous, jelly-like substance, which cannot be separated from water by filtration. He now decants the solution of carbonate of soda, which, by means of evaporation, he obtains again as dry carbonate of soda. As such it can be made use of in further operations.

CORT'S INVENTIONS.

In reference to an advertisement in our Journal of this day, headed "Cort's Testimonial Fund," we extract from the *Encyclopædia Britannica* the following remarks by Mr. William Fairbairn, F.R.S.:—"It would be a difficult task to enumerate all the services rendered by Mr. Cort to the iron industry of the country, or sufficiently to express our sympathies with the descendants and relatives of a man to whose mechanical inventions we owe so much of our national greatness. It is, perhaps, not generally known that Mr. Henry Cort expended a fortune of upwards of £20,000 in perfecting his inventions for puddling iron, and rolling it into bars or plates; that he was robbed of the fruit of his discoveries by the villany of officials in a high department of Government, and that he was ultimately left to starve by the apathy and selfishness of an ungrateful country. When these facts are known, and it has been ascertained that Mr. Henry Cort's inventions have conferred an amount of wealth upon the country equivalent to £600,000,000 sterling, and have given maintenance and employment to 600,000 of the working population of the land for the last three or four generations, we are surely justified in referring to services of such vast importance, and in advocating the principle that substantial proofs of the nation's gratitude should be afforded to rescue from penury and want the descendants of such a benefactor."

SHIPPING REGISTRATION.

To the Editor of the Mechanics' Magazine.

Sir,—With reference to your editorial notice in the *Mechanics' Magazine*, No. 1744, of the Rev. Dr. Woolley's letter, published in the *Times* of the 6th instant, I observe that you have omitted to lay before your readers the introductory clause of Dr. Woolley's letter, in which the Rev. Dr. states the grounds on which he, as a member of the British Association committee on the tonnage question together with myself, deprecates my letter published in the *Times* of the 2nd instant, as being liable to be misconstrued as compromising the deliberations of the committee, and then proceeds to announce his own views in the terms transferred to your columns, thus singularly disregarding his own precepts.

I have merely to remark that my letter in the *Times* of the 2nd instant, to which the Rev. Dr. refers, has not appeared in your columns, and it is scarcely fair towards me thus to lay before the readers of the *Mechanics' Magazine* statements directly impugning my unrecorded letter, and, at the same time, suppressing that portion of the Rev. Dr. Woolley's letter which deprecates further discussion in reply on my part, to which sentiment it is my purpose, as a member of the committee, to pay deference.

I shall be quite satisfied to leave the *whole* matter as published in the *Times* to

the judgment of the readers of the *Mechanics' Magazine*. I remain, Sir,

Your very obedient servant,

CHAS. ATHERTON.

Woolwich Dockyard, Jan. 12, 1857.

[Our object in publishing the letter of the Rev. Dr. Woolley in our last number was, not to produce any impression upon our readers respecting the merits of the discussion between Mr. Atherton and the writer of it, but simply to make known the views of the latter gentleman upon the Shipping Registration question. We could not expunge the name of Mr. Atherton from the paper of Dr. Woolley, but we did omit from it all that especially related to Mr. Atherton's letter, rather than to the question itself. Although it is, perhaps, unnecessary for us to do more than guard against the misconception and misrepresentation of our own acts, we may, nevertheless, remark that we do not consider Dr. Woolley justly liable to the reproach brought against him of "singularly disregarding his own precepts." It will be manifest to all who read the correspondence in the *Times*, that, while Mr. Atherton's letter was very likely indeed to be construed by many into an expression of the views of the British Association committee, Dr. Woolley's, coming after it, and in opposition to it, could not possibly be so received. As we have stated our opinions upon the general question earlier in this number, we need do no more than add here, that we had no thought of acting unfairly in re-publishing the Rev. Dr. Woolley's letter.—ED. M. M.]

STEAM-SHIP PERFORMANCE, &c.

To the Editor of the Mechanics' Magazine.

SIR,—In one of the papers of your talented correspondent, Mr. Atherton, in August last, he gives the following formula for the co-efficient of dynamic performance of steam-ships:

$$\frac{V^3 D^{\frac{2}{3}}}{\text{Indic H}} = C$$

I shall feel obliged if he will inform me whether by "the co-efficient of dynamic performance," he means the useful effect, or if not to what it refers.

Perhaps, also, that gentleman, whose experience must be valuable, or some other of your scientific correspondents, will oblige me with a true formula, used by engineers, to determine the resistance to steam vessels.

For example: What is the resistance to a vessel at fourteen miles an hour, when

Area of midship section = 200 feet,

Length therefrom to bow = 86 feet.

I am, Sir, yours, &c.,

ENQUIRER.

December 31, 1856.

ABSTRACTS OF SPECIFICATIONS OF PATENTS, &c.

IN endeavouring to combine in our pages ample and varied scientific intelligence, with sufficiently copious abstracts of the specifications of all the inventions patented and protected in this country, we have fallen a little into arrears with these abstracts, and many of our readers have consequently experienced some inconvenience. Our attention having been directed to this circumstance, we beg to announce that we will do our utmost to bring them as nearly up to date as is practicable, before the completion of the volume recently commenced; and if we find that our present space is too limited to admit of this, we will meet the case by other liberal arrangements. We are confident that we have not a subscriber who will receive this announcement with dissatisfaction.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

NEWTON, W. E. *Improved apparatus for connecting boats with their tackle, and clearing or detaching them therefrom when lowered from on board ship into the water.* (A communication.) Dated May 6, 1856. (No. 1065.)

Claim.—Employing the weight of the boat when out of the water to keep in place the instrument, contrivance, or fastening for sustaining it, and adapting such instrument, contrivance, or fastening in such a manner that it shall no longer be sustained in its place or socket when the boat touches the water and the weight is taken off the fastening.

NEWTON, W. E. *Improved machinery for making envelopes.* (A communication.) Dated May 6, 1856. (No. 1066.)

This invention relates to a machine for folding and pasting envelopes, wherein the blanks are fed in, the edges of the flap pasted, the flaps folded down, and the envelope thrown out of the machine automatically. The machine cannot be described without illustrations.

HUCKVALE, T. *Improvements in implements for thinning and hoeing turnips and*

other crops. Dated May 6, 1856. (No. 1067.)

In this invention a carriage is constructed consisting of a framing, having at its hinder end, handles. Near the hinder end there is a pair of wheels fixed to an axle, and on this axle is fixed a bevelled tooth-wheel, which takes into and drives another on another axle, which is at an angle to the first axle. On this second axle is fixed a disc or frame to receive the cutters, which are arranged at the periphery, so as to admit of adjustment. These cutters are pointed at their ends and bent forwards so as to pass into the earth (as the disc or frame revolves), and thus remove the row of turnips or other crop, &c.

BROOMAN, R. A. *A method of treating guano and other matters containing uric acid and the manufacture from the products arising from such treatment, as well as from uric acid, of new colouring matters, and the fixing and application thereof.* (A communication.) Dated May 6, 1856. (No. 1068.)

This invention consists—1. In the purification of guano and other matters containing uric acid, by means of muriatic or other acid. 2. In a new colouring product, termed "carmin de pourpre," and in the manufacture thereof by evaporating solutions of uric acid, or of the purified products obtained in nitric acid or other oxidising agents. 3. In fixing upon threads, yarns, and fabrics, silk, wool, cotton, and other materials, by dyeing or printing, the above-named "carmin de pourpre," as well as other colouring matters obtained from the oxidation of uric acid by means of certain metallic salts. 4. In the manufacture of metallic purpurates in a state of lac or coloured powder, and the application thereof upon papers and fabrics, and to painting.

CURTIS, W. J. *Improvements in carriages to run on rail or tramways and common roads.* Dated May 7, 1856. (No. 1071.)

The carriage is made with wheels to run on common roads, but somewhat wider than usual. And to cause the wheels to keep on the rails (when running thereon) there are additional smaller wheels to the carriage suitable for running on the rails, and these additional wheels are capable, by suitable apparatus, of being raised or lowered.

HEATON, R., jun., H. and G. *A new or improved manufacture of balance weights used for counterbalancing pendant lamps and chandeliers, and for other like purposes.* Dated May 7, 1856. (No. 1072.)

The patentees make the balance weights of cast-iron, and afterwards plate and coat them with brass, silver, or other metal or alloy. They make the balance-weight solid, or nearly solid, and so dispense altogether, or nearly so, with lead.

PERINAUD, J. *Certain improvements in preparing or dressing silks.* Dated May 7, 1856. (No. 1074.)

This invention consists in preparing or dressing silks in piece or otherwise, by friction and heat; that is, by applying the silk, after it has been gummed, over heated surfaces, and while there subjecting it to brisk friction by means of a brush, or otherwise, until it may be readily detached from the heated surface. The employment of pins, or other agent of attachment likely to damage the fabric, is thus avoided.

ROYDS, R. *An improvement or improvements in the manufacture of soap.* Dated May 7, 1856. (No. 1075.)

This invention consists in incorporating with the ingredients ordinarily employed in the manufacture of soap, gelatine, and gelatinous substances, with or without borax.

PERREAUX, L. G. *An improved valve.* Dated May 8, 1856. (No. 1076.)

This invention consists in a short passage of vulcanized caoutchouc (or other flexible material) of a certain form, somewhat resembling the mouth-piece of the hautboy. This passage allows a fluid to pass through it in one direction only.

RIDDLE, A. E., and I. H. BOYD. *Improvements in tanning by machinery and chemicals.* (A communication.) Dated May 8, 1856. (No. 1079.)

This invention consists in passing the hides (or skins) frequently through the tanning liquor, or causing the liquor and the hides to circulate in the pit by means of a paddle-wheel-like drum erected over the pit and caused to revolve.

LAWRIE, J. G. *Improvements in steam engines.* Dated May 8, 1856. (No. 1081.)

Claims—1. The working the expansion valves of steam engines by means of links, rods, or levers, connecting the same with reciprocating parts of the engine, such as the side levers of the air-pump, and also the making the connection with such parts in such a manner that the extent of stroke of the expansion valve may be varied as required. Also, the giving motion to expansion valves, when such valves are used in connection with engines in which the cylinders are placed above the level of the crank-shaft, by means of a stem which passes through the opposite end of the valve-box to that through which the stem of the ordinary valve passes. 2. The admitting steam to both the cylinders of a pair of engines, by means of a single valve, perforated with suitable passages, and revolving on an axis continually in one direction. Also, the mounting revolving conical valves used for admitting steam to the cylinders of steam engines on axes, which axes are set up by screws or otherwise, so

as to adjust the friction of the valve on its seat.

AMORY, J. *Improvements in furnaces for locomotive and other steam boilers, which improvements are applicable to reverberatory and puddling furnaces, and to furnaces for heating buildings.* Dated May 8, 1856. (No. 1082.)

This invention consists in the use of hollow fire bridges within the furnace, in connection with pipes for admitting air thereto, and with such an arrangement of apertures for the passage of the heated air from the interior of the bridges to the combustion chambers, that the direction given to the burning gases by the air issuing from a portion of these apertures shall be counter to that of their general progress through the furnace, whereby they are caused to reverberate and become entirely mixed with the heated air injected, and are retained within the furnace a sufficient length of time to be entirely consumed.

FINZEL, C. W., W. NEEDHAM, and J. BARTON. *Improvements in apparatus for filtering sugar and saccharine juices.* Dated May 8, 1856. (No. 1083.)

This invention consists in the adaptation to the filtration of sugar and saccharine juices of the apparatus for which letters patent were obtained 14th July, 1853, by William Needham and James Kite.

BROOMAN, R. A. *Improvements in machinery for felting or sizing hat bodies.* (A communication.) Dated May 8,1856. (No.1084.)

This invention consists in the employment of a revolving circular floor or table in connexion with a vibrating plate overlying the table, and separated from it by a space sufficient to allow the hat bodies to work between the two.

ALLIOTT, A. *Improvements in drying apparatus.* Dated May 8, 1856. (No. 1085.)

This invention consists, 1st., in apparatus whereby, in proportion to the size of the stove used, the drying capacity is increased. The advantage is partly obtained by motion given to the apparatus, whereby the air in the stove is brought into contact with the goods to be dried, and with the heating apparatus employed, and partly for the ease with which the ventilation can be regulated. 2nd. In apparatus whereby great facility of filling and emptying the stove is obtained. 3rd. In apparatus for drying wool.

NEWTON, W. E. *Improved machinery for cutting, punching, and forging, or swaging nuts or washers.* (A communication.) Dated May 8, 1856. (No. 1086.)

The nut blanks are cut off from the end of a bar of heated iron presented to the face of a die, and in succession pushed forward against a gauge by an operator, the hole for the next blank being simultaneously made by a parallel punch. As the blanks are discharged they are taken by a pair of jaws and transferred to, and held in front of a central mandril, which is forced into the central hole thereof, to hold and turn it during the after operations. The punched and cut nut being thus held, it is swaged by sliding swages, and forged on the edges by two hammers, which work in opposite directions, but simultaneously, and at right angles to the axis of the mandril.

DEVAUX, A. C. L. *Improvements in the construction of granaries.* Dated May 8, 1856. (No. 1087.)

This invention relates to improvements upon an invention patented 8th April, 1856.

NEWTON, A. V. *An improved construction of rotary pump.* (A communication.) Dated May 8, 1856. (No. 1088.)

This invention consists in the combination of an angular arm (or bucket) so made as to press the water outward from the shaft, with a spiral partition in the suction pipe, which gives the water an initiatory rotation in the direction contrary to that in which the arms revolve. Also in an arrangement by which the water is discharged around a partition in the chamber of the pump.

NEWTON, A. V. *An improvement in bands for securing bales of goods, and for other like uses.* (A communication.) Dated May 8, 1856. (No. 1089.)

Claim.—The combination of a metallic link or slide with hooked ends, of hoop iron or other metal strips, thus forming a fastening easy of application, and capable of resisting the expansive force of the bale.

UNDERHILL, S. W. *The preservation of life in cases of shipwreck or other casualty at sea, the buoyant cushion.* Dated May 8, 1856. (No. 1090.)

This invention consists of a certain buoyant cushion adapted to sustain the body in water.

JARDIN, L. L., and J. BLAMOND. *Certain improvements in engraving on stone, earthenware, china, and glass, and also in ornamenting the same.* Dated May 9, 1856. (No. 1091.)

This invention consists—1. In a method of employing liquid hydrofluoric acid for ornamenting and engraving on hard siliceous materials. 2. In filling up the interstices of the intaglio design with glass or metals for producing enamel and ornamental damask work.

JOHNSON, J. H. *Improvements in carding engines for carding cotton and other fibrous materials.* (A communication.) Dated May 9, 1856. (No. 1093.)

The patentee has so modified the parts of the top card cleaning and elevating mechanism described in the specification of a patent of his, dated 5th Nov., 1853, as to render the entire apparatus for raising,

stripping, and depressing the top cards, and for moving the frame which carries the same from top to top, dependent for its motion upon one single pulley (or wheel) fixed upon the doffer shaft, and by altering the size of this pulley he regulates at pleasure the number of tops to be stripped per minute. The invention also embraces other improvements.

POTTS, F., and T. VANN. *Certain machinery for ornamenting, floating, burnishing, and polishing metallic tubes, part of which machinery is also applicable for performing the like operation upon other metallic surfaces.* Dated May 9, 1856. (No. 1095.)

This invention relates—1. To ornamenting tubes by double twisting them, and consists in adapting the machinery used for single twisted tubes to double twisting them. The patentees propose to use a machine somewhat on the principle of one patented by Jordan for wood and other carving. 2. To certain machinery for floating, burnishing, or polishing tubes.

JOHNSON, E. D. *An improved mode of mounting marine chronometers.* Dated May 9, 1856. (No. 1096.)

The object here is to neutralise any magnetic polarity that may exist in the balance of marine chronometers; this the patentee proposes to effect by causing the chronometer to revolve slowly on its own vertical axis.

FIRMAN, G. J. *Improvements in the manufacture of sulphuric, tartaric, citric, and oxalic acids, ammonia, and cyanides.* Dated May 9, 1856. (No. 1097.)

In the manufacture of oxalic acid, the patentee adds nitric acid gradually to sugar, molasses, or starch (as in the ordinary manufacture), but the vessel which he uses for the decomposition which ensues upon the application of heat is covered, and so arranged that the gases arising, together with the air or oxygen which is forced in, pass through the saccharine solution before they can escape, &c.

WILEY, W. E. *Improvements in the manufacture of pens and pen-holders.* Dated May 9, 1856. (No. 1098.)

Rests or stops are introduced into the interior of a pen, to support the nibs, to prevent the points being bent too far inwards, and to prevent one nib going under the other.

BASFORD, W. *Improvements in apparatus for purifying coal gas.* Dated May 9, 1856. (No. 1099.)

This invention consists of improvements upon apparatus patented by the inventor 19th October, 1855.

BEAUCHE, L. *A machine for the manufacture of cigars.* Dated May 9, 1856. (No. 1100.)

The principal feature here consists in the use of short endless bands of vulcanised India rubber revolving in contact with each other, in the construction of a machine for manufacturing cigars.

SIMPSON, G. *Improvements in rotary knife cleaning machines.* Dated May 9, 1856. (No. 1101.)

This invention consists in the application of a spring placed within the axle, so as to produce a uniform pressure of the brushes upon the surface of the knife blades.

BROOMAN, R. A. *An improvement in cranes.* (A communication.) Dated May 9, 1856. (No. 1102.)

This invention consists in substituting, for the drum and chain ordinarily employed in cranes, a pitch chain and chain wheel with a case or guide for causing the chain to gear into the wheel.

BROOMAN, R. A. *Improvements in machinery for the manufacture or finishing of tyres, hoops, and rings.* (A communication.) Dated May 9, 1856. (No. 1103.)

This invention refers to machinery for rolling, flattening, or finishing metal tyres, hoops, and rings. The inventor employs two grooved rolls, one above the other, and so arranged that when the rolls are in working position the projections on one roll may come opposite the grooves in the other, and *vice versa.* The rolls are held and brought together by screws. The action of the machinery is as follows:—The upper roll is first raised by weighted levers, and drawn back by a rack; the tyre or hoop is placed in a groove in the lower roll shaped to correspond with the contour to be given thereto; the upper roll is then brought forward, placed through the hoop or tyre, lowered into its place by a lever, and screwed down to bear against the inner surface of the tyre; and, finally, rotary motion is communicated to the rolls.

LAURENCE, F. R. *An improvement in the manufacture of shirt collars and wristbands.* Dated May 9, 1856. (No. 1104.)

This invention consists in making such articles of two thicknesses of linen where it is desirable for them to yield, and of more than two thicknesses in other parts.

BROOMAN, R. A. *Improvements in machinery for manufacturing tubes and pipes, applicable also to the rolling of rods and bars.* (A communication.) Dated May 10, 1856. (No. 1105.)

This invention refers to improvements in seamless tube and pipe-making machinery, and are also applicable to the rolling of rods and bars. The principal novelty consists in a mode of constructing and operating the dies, whereby the reduction of the ingot to the finished tube is effected by a series of motions, and in sections or portions.

JOHNSON, J. H. *Improvements in machi-*

nery or apparatus for cutting irregular forms. (A communication.) Dated May 10, 1856. (No. 1107.)

This invention relates to an arrangement of mechanism for cutting spirals and warped or twisted or other similar irregular forms, in wood or any other material capable of being cut by rotary knives or cutters.

WALLACE, J., Jun. *Improvements in preparing, bleaching, washing, cleansing, and drying textile fabrics and materials and pulpy substances.* Dated May 10, 1856. (No. 1108.)

This invention consists of improvements upon inventions patented respectively by C. B. Clough, Aug. 4, 1853, J. Wallace, jun., April 25, 1855, and J. Wallace, jun., March 3, 1856. All these relate more or less to the introduction of steam and various ingredients into rotating chambers wherein fabrics and other substances are deposited for preparation, cleansing, and drying. It comprehends several modes by which the several improvements may be rendered of increased commercial value, as well as certain novel improvements.

WOTHERSPOON, R. *Improvements in hats and other coverings for the head.* Dated May 10, 1856. (No. 1109.)

This invention relates to the arrangement of double-bodied hats, for securing proper fitting to the head, and due ventilation. The body of the hat is made in the usual way, but an inner separate body is attached to it at the crown. This inner piece carries the usual fitting band at its lower loose edge, and when the hat is on an air space is left all round the head, between the inside of the hat and the outside of the inner shell, from the brim to the crown. The loose shell is perforated, and a small air passage is formed in the centre of the crown, so that free ventilation is fully secured.

RIDAL, J. *Improvements in spring knife handles.* Dated May 10, 1856. (No. 1111.)

This invention consists in forming the said handles of an outer casing or sheath in one piece, and causing the spring to be secured within the body of the said handle, and held by the projecting shoulder of the blade.

BENIOWSKI, B. *Improvements in typographical composition, and in the manufacture of logotypes to be used therein.* Dated May 10, 1856. (No. 1113.)

This invention cannot be described without types, &c. prepared for the purpose.

WHYTOCK, R. *Improvements in apparatus to facilitate the printing of yarns or threads.* Dated May 12, 1856. (No. 1116.)

The patentee takes two cylinders, or two open reels, and places them opposite each other. These are held together by connecting bars, so that they can be lifted from place to place. These reels are covered with a continuous coating of yarn or threads, laid in as regular order as the threads or yarn on a cylinder are, by the following process:—The reels (or cylinders) are each placed between two wheels of rather large diameter. Endless bands connect these wheels, that is, one fore wheel and one hind wheel, so that the two endless bands run parallel. Upon these parallel bands a light carriage is fixed, which conveys the bobbins containing the threads or yarns. The bobbins are passed above the reels, and then under them, until so many coils of threads are placed in regular order, embracing both reels. The reels remain passive, and the hank with the bobbins revolves round them. The distance of the reels from each other regulates the size or length of the coil. These coils may be removed from the reels, and printed on tables or under cylinders for turned-over patterns; but it is proposed to print the coils before removal of the yarn by the patentee's patent printing machine with traversing pulleys.

BESNIER DE LA PONTONERIE, E. *Certain improvements in the apparatus for consuming smoke.* (A communication.) Dated May 12, 1856. (No. 1117.)

These improvements relate to using jets of steam to act upon and combine with the flame and products of combustion as they pass from the furnace through the flues.

SAMUEL, B. *Improvements in the manufacture of combs.* Dated May 12, 1856. (No. 1118.)

This invention consists—1. in the manufacture of combs of horn or tortoiseshell, by pressing a piece of the material into a heated die, and then grinding, rasping, filing, planing, or otherwise cutting away the surface, until the apertures in the open work of the comb appear. 2. In the manufacture of such combs by pressing a piece of the material into a heated die, and then punching or cutting out, by means of a die or dies, the thin plate or film which remains in the apertures of the open work of the comb.

NEWTON, W. E. *Certain improvements in machinery for pumping and forcing water and other fluids.* (A communication.) Dated May 12, 1856. (No. 1119.)

In the improved rotary pumps an elastic tube is employed, and is so acted upon by a roller, as to be alternately collapsed and allowed to expand.

NEWTON, W. E. *Improved machinery for splitting or cutting blocks of wood for match splints, kindling wood, treenails, and other purposes.* (A communication.) Dated May 12, 1856. (No. 1120.)

This invention consists in the use of certain cutters, clearer plates, cranks, and a feeding tube, or combinations thereof, for the splitting or cutting blocks of wood into match splints, &c. The machine cannot well be described without illustrations.

SIMPSON, M. H. *Certain new and useful improvements in machinery for combing wool or various other fibrous substances.* Dated May 13, 1856. (No. 1122.)

This invention cannot be described without illustrations.

TUCKER, H. *An improved spring sacking or foundation for a bed, mattress, or other like article.* Dated May 13, 1856. (No. 1124.)

In this invention a frame serves to sustain a series of supporters or bearers, each of which is composed of an inflexible or slightly flexible or wooden bar, and two bars or rods upheld by, or projecting from springs supported on, or connected to the end bars of the frame.

NEWTON, W. E. *Improved apparatus for generating illuminating gases from coal or other substances.* (A communication.) Dated May 13, 1856. (No. 1128.)

This invention consists—1. In so constructing the upper part of the retort as to form a circuitous passage for the escape of the gas and vapours generated from the material placed in the lower part, whereby the vapours are caused to pass over extensive heating surfaces, and are kept for a considerable time at a high temperature, which causes the greater portion of the vapour which would be condensed on leaving a common retort to be converted into permanent gas. 2. In a novel kind of fastening for the movable heads of the retorts. 3. In a novel arrangement of flues in a bench of five retorts.

NEWTON, W. E. *Improved machinery for removing snow from railroad tracks.* (A communication.) Dated May 13, 1856. (No. 1129.)

This invention was described and illustrated at page 7, No. 1748.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BELL, S. A., and J. BLACK. *An improved method of, and preparation for, igniting matches.* Dated May 7, 1856. (No. 1073.)

The inventor proposes to prepare matches of various kinds, so that they cannot be ignited by rubbing them on any rough substance, but must be brought into contact with a composition prepared for the purpose of acting on and igniting the chemical compound applied to the end of the match. He dispenses with the phosphorus in the preparation at the end of the matches, and prepares a composition consisting principally of phosphorus and gum, and applies the same to the match-box on the outside.

SCHNEIDER, C., and F. LEISS. *Manufacturing a safety boiling apparatus.* Dated May 8, 1856. (No. 1077.)

This invention consists in constructing a conical tube of different metals, wood, glass, &c.; the under part of the tube is cut out in a way that it leaves two or more points, whereon the apparatus stands in the vessel, and allows the liquid to penetrate into the interior of the tube. On the top of the tube is a small opening, to allow the boiling fluid to flow over. A plate is fixed on the top, from which the liquid flows back into the vessel.

MAYER, L. F. *Improvements in photography.* Dated May 8, 1856. (No. 1078.)

This invention consists in substituting linen, &c., for the ordinary materials on the surface of which photographic images are deposited or printed. The chemical ingredients are varied in their proportions so as to adapt the process to the fabric.

NIVEN, J. *Improvements in the manufacture of paper, and in the production of textile materials.* Dated May 8, 1.56. (No. 1080.)

Elm-bark is taken, the external rind removed, and the rest disinteg ated, either before or after boiling in ca stic ley, and the mass worked up as in paper-making from rags. Also paper and textile materials are both to be formed of the Lecistera Formosa, and the spent bark of the tanner, as the raw material of paper.

BAYLISS, W. *Improvements in chains for collieries, cables, and other purposes.* Dated May 9, 1856. (No. 1092.)

This invention consists in composing the chain of double or treble links, welded together during the process of making. The wear upon the links is thus more evenly divided, and the chance of breaking from defects or flaws diminished.

HACKWORTH, J. W. *Improvements in machinery or apparatus for raising and lowering heavy bodies.* Dated May 9, 1856. (No. 1094.)

This invention relates—1. To the use in connection with raising and lowering apparatus, such as that used in working mines, of self-acting contrivances for stopping the winding or raising movement on the cage attaining its proper height. The cage (or any part moving with the cage) is fitted with a catch, and a lever in connection with, or acting upon the stopping movement of the winding machinery, is arranged so that the catch moves it when the cage attains the proper height. 2. To improvements in winding machinery, where a clutch com-

bined with two reversed bevel pinions in gear with one large bevel wheel is used as the means by which the reversing of the winding motion is effected. By these improvements frictional pressure is applied to both sides of the driving pinions.

Binns, J. *Improvements in machinery or apparatus for winding, sizing, and beaming yarns.* Dated May 10, 1856. (No. 1106.)

The inventor proposes to finish the above operations all at the same time. He fixes the bobbins in reels, collects all the threads from the bobbins to form the warp, and fixes opposite the creel in a frame a size trough with rollers At a little distance from the size trough, and on the same frame, he fixes drying cylinders, and at a little distance the beam. He passes the warp threads direct from the bobbins through the trough, the rollers keeping the warp in the size, whence it passes over the drying cylinders and thence to the beam.

Johnson, J. H. *Improvements in drying leather and dressed skins.* (A communication. Dated May 10, 1856. (No. 1110.)

The leather is placed in closed chambers and therein subjected to the action of continued currents of air, previously heated, and forced in by blowing mechanism. The moist or damp air is drawn off as fast as it is produced by exhausting apparatus.

Burkin, W. *Improved machinery for manufacturing painted cloths.* Dated May 10, 1856. (No. 1112.)

This invention relates to means whereby ground colours and varnishes may be spread upon cloths to be converted into ornamental covers for tables, floors, &c. The lengths of cloth are formed into endless webs by connecting their ends. A sheet thus prepared is placed upon rollers mounted horizontally in a frame. One of the rollers has adjustable bearings, to bring the cloth to tension, and to be slackened when the cloth is to be removed. Immediately before the larger roller over which it passes, is mounted a knife or scraper, adjusted to bear upon the upper face of the cloth, and spread the colour evenly over it. Below the cloth a bar is placed, with a roughened surface, composed of two sets of parallel ribs, running in opposite directions, for putting friction upon the cloth, and drawing it tight in its width.

Claus, C. F. *Moistening land, streets, and the better extinction of fires.* Dated May 12, 1856. (No. 1114.)

The inventor employs chloride of calcium, or solutions thereof, or substances containing the same, or chloride of magnesium or solutions thereof, and applies them to land, streets, or fires, in the same manner as water has been applied.

Aimont, P. E. *Certain improvements in manufacturing shoes and other coverings for the foot.* Dated May 12, 1856. (No. 1115.)

This invention consists in a method of manufacturing boots, shoes, &c., in which the sole, quarter, and upper are formed in a single piece, or in two pieces by splitting and dividing the leather; and, also, in a machine (which cannot be described without illustrations) by which the splitting is effected.

Clough, C. B. *Improvements in elongating and contracting metal bars or rods for the obtainment of motive power.* Dated May 13, 1856. (No. 1121.)

This invention consists in employing tubular bars or rods of metal for the ordinary thermal tensional rods.

Parkes, A. *Improvements in the use of collodion in photography.* Dated May 13, 1856. (No. 1123.)

This invention consists in substituting for the sheet of glass ordinarily used, a sheet of collodion of sufficient thickness to support the prepared film.

Parkes, A. *An improvement in preparing materials for and in waterproofing and coating woven and other fabrics, paper, leather, and other substances.* Dated May 13, 1856. (No. 1125.)

This improvement consists in applying products obtained from wood spirit, or other naphthas, in combination with gun cotton, or other vegetable matter similarly prepared, to the making of waterproof articles, and for coating fabrics, paper, leather, &c.

Boosey, C. *Improvements in music-stands for the use of military and other bands.* (A communication.) Dated May 13, 1856. (No. 1126.)

A central pole is used, to the upper end of which a series of rods are jointed, to which rods are again jointed other rods, attached at their further ends to a ring which slides on the central pole; thus a frame is made similar to the frame of an umbrella, but much larger. The rods which are jointed at one end to the pole are connected at their lower ends by a band.

PROVISIONAL PROTECTIONS.

Dated November 20, 1856.

2751. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. A method of and certain varnishes or compositions for rendering wood and other substances uninflammable and fire-proof, applicable also to the indurating of calcareous earths and stones, and to the rendering of paper and fabrics damp proof, together with apparatuses for manufacturing such compositions. A communication from Madame Boulard.

Dated December 3, 1856.

2866. Thomas Crabtree, of Halifax, machine

maker. Improvements in card-setting machines and in certain machinery or apparatus employed in the construction thereof, which apparatus is also applicable to similar purposes.

Dated December 17, 1856.

2985. John Smith, of Heywood, Lancaster, colliery underlooker. Improvements in machinery for pumping.

Dated December 18, 1856.

2995. Francis Barber Howell, of Lebanon, Ohio, U.S.A., farmer, and of High Holborn. Improvements in machinery for cutting or making corks. A communication.

2997. William Hartley, of Bradford, York, worsted spinner. Improvements in spinning frames for spinning wool, hair, alpaca, cotton, silk, flax, or any other fibrous substances, on spools, paper tubes, or any kind of bobbins.

2999. George Miller Clarke, of Goldington, Herts. Improvements in the manufacture of moulded candles.

3001. William Knox Wigram, of Lincoln's-Inn, barrister-at-law. An apparatus for igniting lucifer matches, or matches tipped with phosphorus or igniting composition.

3003. John Brown, of Liverpool, mast maker. Improvements in the construction of ships' yards.

3005. Warren A. Simonds, of Boston, U.S.A. An improved life-preserving float.

Dated December 19, 1856.

3007. William Rye, of Oldham, Lancaster, engineer, and James Simpson, of the same place, machine maker. An improved self-acting willow for opening cotton and other fibrous materials.

3009. Charles Massi, of Greville-street, Hatton-garden. Improvements in apparatus for mounting cameras.

Dated December 20, 1856.

3013. Henry Batchelor of Newport, Monmouthshire. Certain improvements in steam boilers.

3015. Thomas White, of Sleaford, Lincoln, manufacturer. A new or improved manufacture of boots, shoes, and other coverings for the feet.

3019. Charles Cave Wilkinson, of Hermes-street, Pentonville, engineer. An improvement in carving forks.

Dated December 22, 1856.

3021. Robert Gibson, of Hull. An improved self-acting apparatus for signalling on railways.

3023. William James Payne, of Waterloo-road, Lambeth, brassfounder. Certain improvements in casting and finishing cocks for general purposes.

3025. Louis Antoine Lang, of Rue de Chaillot, Paris, proprietor. A new system of rotatory motion for all kinds of vehicles.

3029. William Henry Stratton, of Lambeth-walk, tobacconist. Improvements in the fire-doors of furnaces.

3033. Edward Stanford, of Charing-cross, stationer. An improvement in the manufacture of envelopes.

3035. William Smith, of Salisbury-street, Adelphi, civil engineer. Certain improvements in railway rolling stock. A communication from J. B. Humphreys, C.E., of Rio de Janeiro.

Dated December 23, 1856.

3037. Joseph Sharp Bailey, of Keighley, York, machine wool-comber. Improvements in machinery for combing wool and other fibrous materials.

3038. William Spence, of Chancery-lane. Improvements in the manufacture of felt. A communication from E. P. J. M. Albert.

3039. James Robertson Dick, of Alnwick, Northumberland, mechanist. Improvements in window-sashes.

3040. William Edward Newton, of Chancery-lane, civil engineer. An improved mode of manufacturing capsules for containing medicines. A communication from J. Hegnauer.

3041. William Edward Newton, of Chancery-lane, civil engineer. Certain improvements in meters for water and other liquids. A communication.

3042. John Anderson, of Woolwich, engineer. Improved means of protecting floating batteries, ships, land batteries, martello towers, or other constructions, against shot or shell or other projectiles.

3043. William Farrer Ecroyd, of Marsden, Lancaster, worsted manufacturer, Jonathan Heyworth, of the same place, manager, and George Scarr, of Burnley, Lancaster, mechanic. Improvements in looms for weaving.

3044. James Lark, of Bridge-foot, Vauxhall-cross, Surrey. Improvements in kilns for burning materials in the manufacture of lime and cements.

3045. Julien Louis Guillaume Bailly, of King-square, watch and clock-maker. Improvements in winding up or maintaining the power of clocks.

3047. Felix Dehaynin, of Paris, civil engineer. Improvements in machinery for moulding and pressing artificial fuel and plastic substances, and for driving the same from the moulds.

3048. George Washington Van Abbott, of Croydon, Surrey, gentleman. An improvement in bank-notes, which is also applicable to share certificates and other similar documents.

3049. Alfred Heather, of Portsmouth, Esquire. Improvements in ferry-boats.

Dated December 24, 1856.

3050. William MacNaught, of Manchester, engineer. Certain improvements in steam engines.

3051. Benjamin Goodfellow, of Hyde, Chester, engineer. Improvements in the construction of steam boilers.

3052. William Macpherson, of Manchester, manager. Certain improvements in machinery for spinning and doubling cotton and other fibrous materials.

3053. Giuseppe Antonio Giovanni Nani, of Leicester-square, gentleman. Improvements in toys for the use of children.

3054. William Taylor, of Nottingham, manufacturing stationer. Improvements in producing various ornamental effects upon fabrics, paper, and other surfaces.

3055. James Samson Barraclough, of Halifax, dye-ware grinder. Improvements in the means, machinery, or apparatus used for grinding dye-wares.

3058. John Elliott, of Sunderland, engineer. Improved machinery for manufacturing rivets, bolts, spikes, and other similar articles.

Dated December 26, 1856.

3061. Jacques Hostein, ainé, of Bordeaux, France. An improved mechanism for stopping railway trains.

3062. David Macdonald, of Glasgow, manufacturer. Improvements in washing, bleaching, cleansing, and preparing textile fabrics, and materials.

3063. William Smith, of Margaret-street, Cavendish-square, engineer, and Donald Bethune, of Cambridge-terrace, Hyde park, Esquire. Consuming or preventing smoke in chimnies and furnaces.

3065. William Irlam, of Newton-heath, near Manchester, engineer. Improvements in the construction of railway turn-tables and weighing-cranes.

3066. Sidney Newburgh, of Islington, merchant, and Charles Steinhart, of Great Alie-street, City, merchant. Improvements in keys, and certain

means for preventing the picking of locks. A communication.

3067. Frederick Campin, of the Strand. The manufacture of a certain textile fabric, which the inventor terms, "tissue buffle." A communication from P. H. Moullin.

3068. John Clay, of Birmingham, surgeon. A new or improved portable printing or impressing instrument.

3069. John McIntyre, of Newcastle-upon-Tyne. A safety sounding apparatus or alarum for sailing ships and steam vessels.

3070. Henry Horace Goodman, of Rue Grange Batelière, Paris, banker. Improvements in the construction of locks. A communication from W. H. Akins.

3071. William Lawrence Mitchell, of Albert-terrace, London-road, Southwark. Improvements in railway switches and signal apparatus.

3072. George Heppell, of Uttoxeter, Stafford, engineer. An improved method of producing signals in railway trains by means of air.

3073. William Clarke Deeley, of Devonshire-terrace, Westbourne-terrace, Hyde-park. Improvements in reducing copper ores. A communication.

3074. William Clark, of Chancery-lane, engineer. Improvements in air and waterproof coatings, and in their applications. A communication.

Dated December 27, 1856.

3075. Richard Reeves Cox, of Fareham, Hants, coal merchant. Improvements in the manufacture of artificial fuel, and in machinery for that purpose.

3077. William Edward Newton, of Chancery-lane, civil engineer. Improvements in sewing machines. A communication.

3078. Thomas Shaw, of Ilkeston, Derby, gentleman. Improvements in furnaces or fire-places.

3079. James Petrie and William McNaught, of Rochdale, Lancaster, engineers. Improvements in steam engines.

3080. Thomas Wilks Lord, of Leeds, consulting machinist. An improved mode of drying flax, tow, hemp, silk, cotton, and other yarn, in the process of dressing, warping, sizeing, beaming, and preparing yarn for weaving.

3081. William Swain, of Birmingham, engineer. Improvements in heating and ventilating.

3082. George Ritchie, of Ponsonby-street. Improvements in the manufacture of beds and mattresses.

3083. John Cheesman Wagstaff, of Cannon-street, City. Improvements in the manufacture of felted cloth. Partly a communication.

3084. Isaac Atkin, of Nottingham, lace manufacturer, and Marmaduke Miller, of Nottingham, steam gauge maker. Improvements in folding lace, paper, and other fabrics.

3085. Joseph Morel, of Gap, France, mechanician. Improvements in castors for fitting under the feet of tables, seats, and other similar pieces of household goods.

Dated December 29, 1856.

3087. Horace Vaughn, of Providence, Rhode Island, U.S.A., now of Manchester, gentleman. An improved method of hardening and tempering steel, and of hardening cast and wrought iron.

3088. Joseph Henry George Wells, of Essex-street, Strand, mechanical draughtsman. Improvements in pumps, and valves used therewith. A communication from H. F. Bérenguier.

3089. Timothy Alden, of New York, U.S.A., mechanical engineer. Setting and distributing printing types.

3090. John James Speed the younger, and John Aylesworth Bailey, of New York, U.S.A. Improvements in the manufacture of seamless pipes and tubes.

Dated December 30, 1856.

3092. Jean Louis Celestin Le François de Grainville, of Rue de l'Echiquier, Paris, ex-captain of the imperial navy. Certain improvements in heating apparatus.

3094. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in the construction of portable houses and other buildings. A communication from F. Seiler.

3096. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improvement in sawing machinery. A communication from Saint Albin Hugues.

3098. George Alfred Shaw, of Dartmouth-row, Blackheath, Kent. An improved machine for thrashing and cleansing corn or grain. A communication from C. Vai.

Dated December 31, 1856.

3100. Jean Omer Henry, of Rue de l'Echiquier, Paris. Certain improvements in the production of embossed surfaces on wood.

3102. William Bray, of Folkstone, Kent, engineer. Improvements in traction engines.

3104. Alexander Robert Terry, of Bedford-row, civil engineer. Improvements in machinery for cutting sugar and other substances.

3106. William Charles Mann and Frederick John Ingram, of East-parade, Leeds. An improved mode of embossing cloth or other fabrics.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January 13th*, 1857.)

2026. M. E. Bowra. Improvements in the layin or placing of rails or chairs for railway and other purposes in the shape of beds or springs or elastic sleepers.

2037. J. Apperly. Certain improvements in the process of preparing cotton, wool, flax, and other fibrous substances for spinning, and in carding and preparing machinery.

2039. G. C. Thomas. An improved method of making steel. A communication.

2044. L. Cornides. A new method of dressing or preparing hides, skins, intestines, and such like animal substances.

2048. J. Mozard. Improvements in the construction of miners' lamps.

2053. J. T. Hart. Improvements in apparatus for modelling statuary from life, and for measuring and copying statuary and other uneven surfaces.

2057. W. Keates. Improvements in the process of reducing copper to the metallic state from ores, and other materials containing copper, and in the furnaces employed therein.

2058. G. Anderson. Improvements in the combustion of tar and other similar matters in heating gas retorts, and in the consumption of smoke arising therefrom, and from other fuels used therewith.

2060. W. Moberly. Improvements in the grinding and polishing of curved and rounded surfaces. A communication.

2061. J. L. Tabberner. Certain improvements in smelting ores.

2071. T. Burstall. Certain improved machinery for manufacturing bricks and tiles from clay alone, or mixed with other materials.

2077. J. Juckes. Improvements in stoves or fire-places.
2081. C. L. Lapito. A machine for manufacturing of mortar and concrete.
2083. P. A. L. de Fontainemoreau. Certain improvements in making artificial stone for statues and ornamenting purposes. A communication.
2092. B. Sabatier. Improvements in photography.
2105. W. Smith. A powerful compound whistle. A communication.
2106. H. Cooke. Certain improvements in dyeing yarns or threads.
2113. J. Taylor. An improvement in building walls.
2122. J. Gedge. Improvements in paint or colouring matter, applicable to coating metals and other substances, whereby the oxidation of metal is prevented and resistance to the action of the atmosphere, rays of heat, or acids is secured. A communication.
2140. J. Elliott. An improved apparatus for containing and supplying water, gas, and other fluids, applicable also as a fluid meter.
2150. S. C. Lister. Improvements in preparing and spinning cotton, flax, and similar fibres.
2155. C. F. Clements. An improvement in separating copper and other metals from ores containing them.
2166. R. A. Brooman. Improvements in water-closets and night-stools. A communication.
2167. J. Elliott. An improvement in taps and cocks.
2176. A. Andraud. Certain improvements in wheelbarrows.
2188. A. G. Guillaumin. An improved ramrod.
2237. P. W. Barlow. Improvements in the permanent way of railways.
2278. D. Thom and G. A. Phillips. Certain improvements in apparatus used in the manufacture of soap.
2292. G. Flint, T. Wood, and E. Wood. An improved punching-press or machine, adapted to the purposes of stamping, coining, slotting, and embossing, and for cutting metal and other substances.
2558. B. Goodfellow. Certain improvements in the construction of steam boilers, and in the mode of supporting steam boilers on their seatings.
2765. R. A. Brooman. A method of and preparation for rendering textile and other like fabrics sanitary and disinfecting agents. A communication.
2836. J. Gedge. Improvements in lubricating the journals of the axles of railway vehicles or other moving parts of machinery. A communication.
2837. J. Gedge. Improvements in gas-meters. A communication.
2867. A. Bullough and W. Bullough. Improvements in looms.
2890. L. P. Kerdyk. Certain improvements in machinery or apparatus for extracting colouring matters to be employed for the purposes of dyeing, or for other similar processes.
2906. J. Aston and J. Brant. An improvement in the manufacture of covered buttons and covered ornaments.
2948. L. J. F. Margueritte. Improvements in purifying rock and sea-salt.
2974. A. V. Newton. Improvements in machinery for boring, turning, tapping, and screwing fittings for gas, water, steam, and other pipes, and in vices for holding the same while they are operated upon. A communication.
2977. E. Heywood. Improvements in machinery or apparatus used in weaving.
2983. W. E. Newton. An improved process or processes of treating feldspar so that it may be used as a manure, or for obtaining potash or soda therefrom. A communication.
2997. W. Hartley. Improvements in spinning frames for spinning wool, hair, alpaca, cotton, silk, flax, or any other fibrous substances, on spools, paper tubes, or any kind of bobbins.
3005. W. A. Simonds. An improved life-preserving float.
3022. W. Mill. Improvements in joining bands, in connecting fastenings to bands, and in attaching bands to articles requiring the same.
3030. J. Redgate, E. Ellis, and J. Cropper. Improvements in bobbin-net or twist-lace machinery.
3037. J. S. Bailey. Improvements in machinery for combing wool and other fibrous materials.
3060. C. S. Rostaing. Improvements in preparing and combining metallic substances for the production of colours, and in manufacturing the same.
3062. D. Macdonald. Improvements in washing, bleaching, cleansing, and preparing textile fabrics and materials.
3089. T. Alden. Setting and distributing printing-types.
3090. J. J. Speed, jun., and J. A. Bailey. Improvements in the manufacture of seamless pipes and tubes.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1854.

39. Anthony Bernhard Baron Von Rathen.
45. Benjamin Burleigh.
47. Richard Albert Tilghman.
48. Richard Husband.
56. William Renwick Bowditch.
60. Adolphe Drevelle.
67. Felix Lieven Bauwens.
70. Marcel Vetillart.
101. George Fergusson Wilson.
102. George Fergusson Wilson.
109. Henry Holland.
212. Josiah Latimer Clark.
224. Benjamin O'Neale Stratford, Earl of Aldborough.
325. Benjamin Hornbuckle Hine, Anthony John Mundella, and Luke Barton.
365. Benjamin Hornbuckle Hine, Anthony John Mundella, and William Onion.
962. Andrew White Gibson.

LIST OF SEALED PATENTS.

Sealed January 9, 1857.

1626. Moss Defries.
1631. John Marsh and John Catt.
1633. Samuel Hardacre.
1639. John Westwood.
1643. Edward Henry Cradock Monckton.
1646. Thomas Madely Hartwell, James William Gladwin, and Henry Gladwin.
1657. William Williams.
1697. John Hamilton, jun.
2165. George Tomlinson Bousfield.

2293. John Dauglish.
2359. Peter Ward.
2365. James Atkinson Longridge and Thomas Richardson.
2376. William Johnson.
2463. William Clay and Josiah Harris.
2493. John Dearman Dunnicliff and Walter Dexter.
2595. William Edward Wiley.
2597. James Fernihough and Robert Farrow.
2664. William Henry Balmain and Thomas Colby.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

The publication of several articles and numerous letters is unavoidably deferred.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

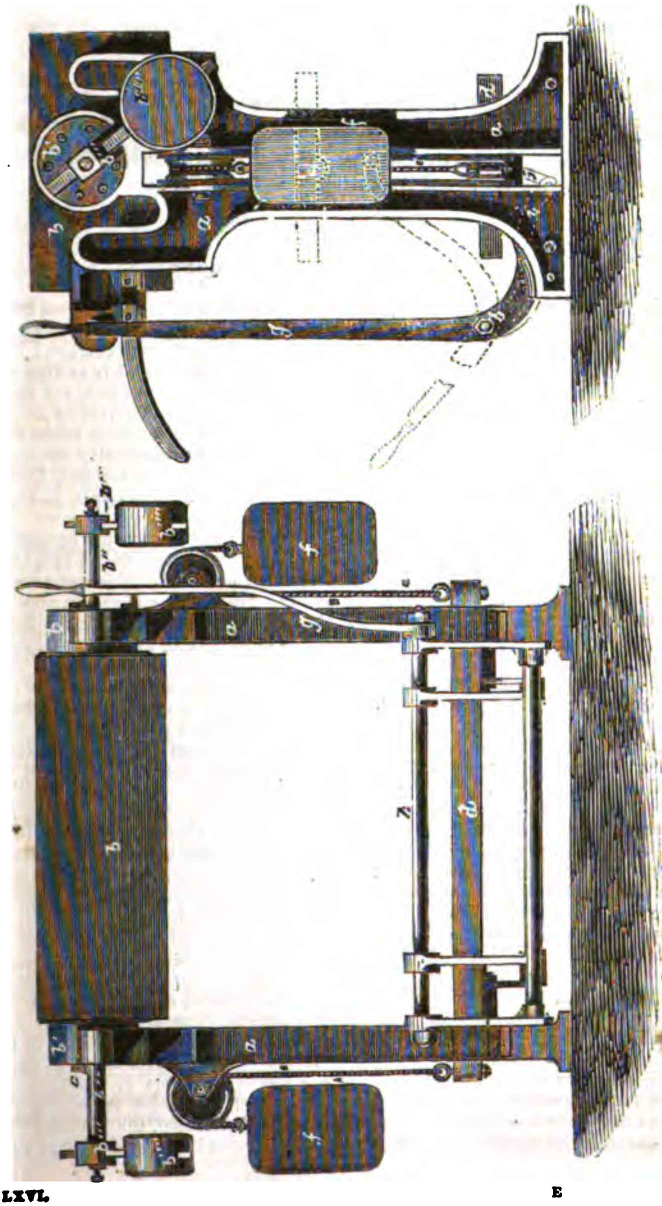
No. 1746.] SATURDAY, JANUARY 24, 1857. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

JOBSON'S PATENT APPARATUS FOR MAKING MOULDS FOR CASTING METALS.

Fig. 2.

Fig. 1.



JOBSON'S PATENT APPARATUS FOR MAKING MOULDS FOR CASTING METALS.

MR. ROBERT JOBSON, ironfounder, of Wordsley, Stafford, has obtained a patent for a peculiar combination of apparatus to facilitate the making of moulds for casting metals, with a view to render it unnecessary that the workman should turn over the flasks or boxes by hand. For this purpose the apparatus is so arranged that the flask or box in which a mould is to be made is fixed to a horizontal platform or bed plate, which is mounted on horizontal necks or axes. The box or flask having been fixed to the horizontal plate or platform, the ramming is to be performed in the ordinary manner; and then, in place of the workmen lifting and turning the flask or box over by hand, which is a very laborious task when the flask or box and pattern are large and heavy, the plate or horizontal platform is caused, by a suitable crank handle, or otherwise, to be turned over, so that the upper surface of the horizontal plate or platform comes undermost. A second plate or platform is then raised, so as to come under the flask or box and mould therein. This second platform is then lowered with the flask or box and mould; the pattern, either remaining in the mould, or else being secured to the rotating platform, is retained to have another mould formed thereon.

Fig. 1 of the accompanying engravings shows a front elevation of the machinery combined according to the invention; fig. 2 shows a side elevation; and fig. 3 a horizontal section. *a a* is the framing of the machine, the nature of which is clearly shown in the engraving; *b* is the bed, moving on necks or axes, *b′ b′*, which turn in suitable bearings, as shown. It is preferred that this bed, *b*, should consist of a rectangular open frame, *b*, with an inner flange all round, to which an upper plate is fixed, and which may be changed according to the work intended for the time being to be performed thereon; but the plate or upper surface of the bed, *b*, may form part with the frame, which is carried by the axes or necks, *b′*. On the plate thus fixed to, or forming part of the bed, the pattern of the intended casting is placed, and when desired, fixed thereon; the flask or box in which a mould is to be made is also placed thereon, and retained by suitable latches or holding apparatus; the sand is then rammed in the flask or box in the ordinary manner, and when complete the flask is to be turned over by a half revolution of the bed, *b*, and it is the mounting of the bed, *b*, whether formed with a fixed or moveable upper plate, which constitutes the peculiarity of the invention.

Mr. Jobson states in his specification that he is aware that it has heretofore been the practice to have necks or axes on the mould boxes or flasks used, and to turn the same over thereon after the mould has been completed therein; he mentions this fact in order to show that he does not make any claim to the so mounting of flasks or boxes on axes or necks, as the same is an inconvenient arrangement. He, however, states that his invention is directed to the remedying of this inconvenience, which is most effectually accomplished by placing the bed or plate, *b* (on which the flask or box is placed), on axes or necks, so that when the mould has been made in the flask or box, the same may, with the table, *b*, be turned over; the flask or box with the mould therein may then be readily detached from the bed, *b*, and be received on to a second table or plate below, the pattern remaining fixed to the bed, or remaining in the mould, according as the pattern is or is not fixed to the revolving bed, *b*. The bed, *b*, may be then caused to resume its original position, another box or flask may be placed thereon, and another mould proceeded with.

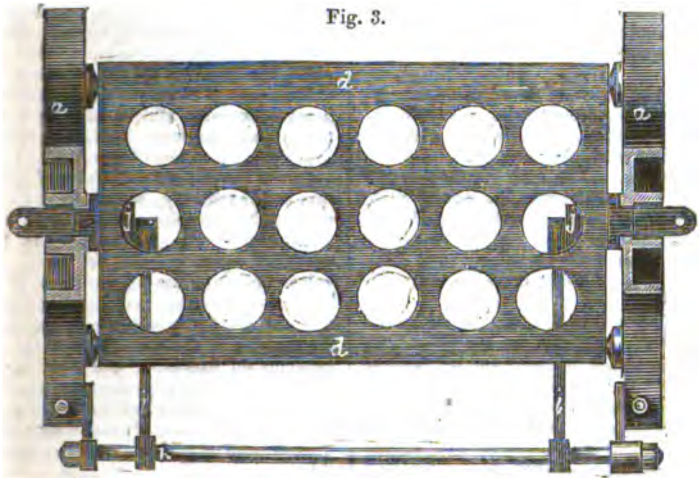
The arrangement for retaining the revolving bed or plate, *b*, in position, and for turning it over may be varied; but the patentee prefers to use the machinery shown in the engraving. *c c* are two projecting stops, one at each end of the bed, *b*; these projections prevent the bed going beyond the horizontal position when making the mould thereon, and also when the bed, *b*, is turned over to have the mould and flask detached; the axes or necks, *b′*, where they turn in their bearings, are of comparative large diameter, as shown, and in order to apply counterbalance weights, *b′′′′ b′′′′*, there are projections, *b″*, at the ends of the axes, *b′*, which receive arms, *b‴*, with the counterbalances, *b′′′′*, as shown.

In order to receive the mould box or flask and mould therein when they are turned over with the bed, *b*, he prefers to use a rising platform or plate, *d*, which is guided by the end framing, as shown. *e e* are cords or chains, having balance weights, *f f*, fixed thereto, according to the weight of the boxes or flasks and moulds to be received on to the platform or plate, *d*. The platform or plate, *d*, is raised by means of a lever, *g*, on the axis, *h*, which, by means of the arms, *i i*, and links, *j j*, raise the plate or platform, *d*, under the top of the flask or box when it has been turned over; the latches or holding apparatus by which the flask or box is held to the bed, *b*, are then released, the platform or plate, *d*, is then lowered with the flask thereon; the bed, *b*, is turned over, and is then again in posi-

tion to receive another flask or box. The bed, *b*, is turned over by means of a handle fixed to the front of the bed, *b*, and the patentee generally fixes a plate over the top of the flask or box before turning it over, to prevent the mould being injured.

The patentee remarks that he makes no claim to the use of a rising plate or platform, *d*,

Fig. 3.



and the same may be dispensed with by having the machine arranged in such manner that the bed, *b*, in addition to turning on axes or necks, may, when it is turned over, descend towards the ground, in order to deposit the flask or box on to the floor, or on to a truck placed below to receive it.

THE SCIENCE OF THE ENGINEER.

BY W. J. MACQUORN RANKINE, C.E., F.R.SS. L. & E., &C., REGIUS PROFESSOR.

(*Concluded from p.* 4.)

I will now point out more specifically the nature of those branches of science which are applicable to the art of the engineer.

Those branches of science fall under the general head of *mechanics;* but they are distinct in method and application (though not in principle) from *astronomical mechanics*, which treat of the motion of the stars, and from those parts of *physical mechanics* which relate to such subjects as the transmission of sound and light. They are also so far to be kept distinct from *pure* or *abstract* mechanics, that in treating specially of mechanics as applied to engineering, certain fundamental principles are to be taken for granted, the demonstration of which forms part of the course of natural philosophy. To that course, also, must be left all mechanical problems, which are interesting in a scientific point of view only, and not practically useful.

I have already frequently referred to *structures* and *machines*, as being the objects to which the science of the engineer relates.

Strictly speaking, all *machines* are *structures*, though all structures are not machines; but it is convenient to limit the term *structures* to those combinations of solid materials, whose parts are not intended to have relative motion; and which are thus distinguished from *machines*, whose parts are intended to have relative motion and to perform work.

The theory of structures is founded on the principles of statics, or the science of equilibrium. It is divided into two parts, relating respectively to the two requisites of a structure, *stability* and *strength*:—stability being the power of resisting forces tending to overthrow the structure, or to derange the parts of which it is made from their proper relative positions, and strength, the power of resisting forces tending to alter the figures of those parts, or to break them in pieces.

For example, in a bridge, *stability* requires certain relations to exist between the distribution of the load, the figure of the arch, and the dimensions of the abutments, in order to prevent the dislocation of the arch-stones, or the overthrow of the abutments; and *strength* requires the arch to be of a thickness sufficient to resist the tendency to crush it.

In applying the principles of stability and strength to structures, regard must be had to the special properties of the materials employed, whether earth, stone, bricks, cement, timber, iron, or other metals, as well as to the kind of workmanship to which each material is subjected, and the forms in which it is used.

The end to be aimed at in every scientifically designed structure, is to adjust exactly the position, form, and size of the whole and of each part, to the forces which it has to sustain. The more nearly this end is attained, the better will the structure be, not only in efficiency, durability, and economy, but also in beauty. This, independently of ornament, is the fundamental principle of beauty in architecture, as well as in engineering.

The theory of *machines* is founded on the principles of *cinematics*, or the science of motion considered in itself; and on those of *dynamics*, or the science of the relations between motion and force.

Pure mechanism is the name which has been given to the *cinematical* part of the theory of machines, or that which takes into consideration their action transmitting and modifying motion only, without regard to the force which is at the same time transmitted. As examples of its application I may cite the parallel motion, the arrangement and proportioning of wheels, and the correct shaping of their teeth. The science of pure mechanism has of late been brought to a very complete state, and reduced entirely to the consequences of one general principle.

The *dynamical* part of the theory of machines considers them as transmitting at once, both motion and force, or performing *work*. It treats of the resistances, whether from solids or fluids, which impede the action of machines, the means of regulating that action, and the nature of the sources of motive power, whether animal strength, the gravitation of water, the currents of the air, or the mechanical action of heat. The entire theory of the work of machines is founded on one principle, that of the *conservation of energy*.

Machines have further to be considered with reference to their *strength*, or capacity for sustaining without injury the forces which they transmit.

The term *Civil Engineering* is applied to a wide and somewhat indefinite range of subjects; but it may be defined as embracing those applications of mechanics, and of the arts of construction generally, which belong to *lines of transport* for goods and passengers, whether roads, railways, canals, or navigable rivers,—to works for the conveyance of water, whether for drainage or water-supply,—to harbours, and works for the protection of the coast. All these kinds of works are combinations of structures and machines; they comprise *structures*—in earthwork, as cuttings, embankments, and reservoirs,—in masonry, timber, and iron, as bridges, viaducts, aqueducts, locks, basins, piers, and breakwaters; they comprise machines, such as carriages and locomotive engines, lock-gates, sluices, and valves, pumping steam-engines, dredging-machines. Their principles therefore consist to a great extent of the general principles of construction and machinery, combined and adapted to suit the circumstances of each kind of work. But civil engineering has besides some principles peculiar to itself. It involves the art of laying out lines of transport, and selecting the sites for works, in the best manner possible with reference to the features of the country, so as to secure economy in execution and working. Hydraulic engineering involves the laws of rainfall and of the supply and the flow of streams; and the engineering of coast-works requires a knowledge of the action of the waves and tides.

Such is a brief and general outline of the nature of the branches of mechanical science which contain the principles of the art of the engineer. The application of those principles to practice is an art of itself; for this amongst other reasons:—that the exact expression of a mechanical principle is often of considerable mathematical intricacy; whereas it is desirable, that rules for practical use should be as simple as possible; and the engineer, in such cases, requires to be able to judge how far it is allowable, for practical purposes, to sacrifice absolute exactness for the sake of simplicity.

Although Mechanics is the science with which the engineer is chiefly concerned, and although the course of lectures which I am about to deliver must be confined to mechanical facts and principles, with their consequences and applications—still it is right that I should point out other departments of science which every engineer would do well to study. These are, Geology and Mineralogy, Chemistry, especially in so far as it relates to the properties and treatment of metals, and of building materials, and Botany and Vegetable Physiology, with special reference to timber trees.

Besides the knowledge of the scientific principles of his profession, there is a kind of knowledge required by the engineer which may be called *purely practical*, and which no lectures, books, or study can teach. It comprises the power of judging of the quality of materials and workmanship, which can only be acquired by in-

specting them on every opportunity; the art of directing the operations of workmen —that of judging of commercial questions connected with engineering schemes—and that of conducting business generally, which are to be learned by personal experience alone. But the engineer who has studied the science of his profession possesses a great advantage in the acquisition of purely practical knowledge, and learns much more rapidly and soundly from his personal experience, than one who is without theoretical knowledge; for the scientific engineer possesses a system of principles, the embodiment of the experience of his predecessors, and of the experiments and reasonings of those scientific men who have studied practical mechanics, which enable him to classify the facts that he observes, and to draw from them sound conclusions.

Let the young engineer be convinced, that the profession which he studies is not a mere profitable business, but a liberal and a noble art, tending towards great and good ends; and that to strive to the utmost to perfect himself in that art, and in the sciences on which it depends, is not merely a matter of inclination or of policy, but of sacred duty.*

On the Physical Conditions involved in the Construction of Artillery, &c., &c. By Robert Mallet, Member of the Institute of Civil Engineers, A.B., T.C.D., M.R.I.A., &c. London: Longman, Brown, Green, Longmans and Roberts, 1856.

We live in an iron age. Contrary, however, to the predictions of the ancient poets, our iron age need not be ashamed of comparison with any age which has preceded it, whether we look to its moral or physical attributes. The vast discoveries of gold fields in California and Australia might, at the first blush, carry back our thoughts to the golden age: but a very little consideration will still convince us of the predominance of the iron quality in our times: for if the vast quantities of gold which have poured into Europe from these quarters have materially affected our commercial operations, it cannot be denied that it is mainly through the instrumentality of iron that the diversion of gold has been brought about, and that precious metal been enabled to assert its influence. Everything consequently affecting the baser, but not less useful metal, whether as regards the economy and improvement of the processes of its manufacture, or its literature in general, possesses great interest.

During the latter half of last year the whole metallurgic, engineering, and manufacturing worlds were deeply agitated by the announced discoveries of Mr. Bessemer, which, it was supposed, would inaugurate a new era of splendour heretofore undreamt of in the commerce of Great Britain. It is, perhaps, premature to pronounce definitely on the value of Mr. Bessemer's supposed discoveries; but we may safely assert, that the brilliant expectations of that gentleman's admirers are not destined to receive a proportionate fulfilment, and that the great fame of Cort is as yet unrivalled.

Mr. Mallet's book, although, as we shall show, far from perfect, we hail as a meritorious and useful addition to our metallurgic literature. He has laboured with very considerable success in the less brilliant, but permanently useful field of collating facts and experiments, and deducing from them practical information with regard to the nature of iron and to the received modes of manufacturing it, which commends itself to the reason, and, we think, must ultimately very much modify the forms of many of the engines, machines, and other implements of which cast iron is the material. The author, writing in the excitement of the late war, has directed his observations mainly to the manufacture of ordnance, but they are readily applicable to all machines manufactured of cast iron.

To the treatment of that portion of his work which discusses the molecular constitution of cast iron, the effects of temperature and physical conditions induced in moulding and casting, the effects of rigidity and repeated discharge in iron and other guns, and other considerations of a similar nature, Mr. Mallet has brought a large amount of carefully digested reading, very considerable practical experience, and solid judgment. In these questions he is evidently at home, and revels with that delight which marks the well-informed man, treating of a subject of the difficulties and bearings of which he is thoroughly master.

We must in the outset observe that Mr. Mallet does not always use scientific terms in their strictly technical sense. Writing for the information of the practical man, he has evidently felt the difficulty of stating the conclusions at which he has arrived, *briefly*, and at the same time with a strict attention to scientific definition. Perhaps he is not well enough versed in the exact sciences, to be fully alive to the value of exactness of definition. The term "principal axis" is frequently used in this loose man-

* The above lecture, in a complete form, has been published by Griffin and Co., London and Glasgow.

ner, but we do not think the meaning of the author is greatly, if at all, obscured in consequence, or that any reader will experience much difficulty on this account in possessing himself of the facts which are pressed upon his attention. There are many indications in the work, that Mr. Mallet is not a profound mathematician, or we should rather say, that his notions of the theory of mechanics are indistinct and confused in the extreme. This is the great blemish of his book, and we fear that this must be attributed to his anxiety to make his work as perfect as possible. He has availed himself of the labours of Dr. Hart, Fellow of Trinity College, Dublin, and an expert mathematician, in the investigation of the problem on which his theory of wrought iron-guns is founded. It is to be regretted that he did not use his assistance, or that of some other competent person, in the other portions where the theory of mechanics plays a part. Better still would it have been had our author confined himself entirely to the discussion of those questions which are his proper element, and omitted entirely those other questions which are evidently not his forte, and which besides are much more amenable to controversy. We do not think that a professed treatise is the proper vehicle for a new theory which may be the subject of doubt and question. The pages of a scientific journal, or the transactions of a learned society, are much more suited for this purpose; while a treatise, in many respects deserving of commendation, is marred by its introduction; and instead of being rendered more perfect, has its value greatly diminished. We would seriously recommend Mr. Mallet, if a second edition of his book is called for, to make this separation of what is sound, from what is, we will not be so uncourteous as to say unsound, but as he himself will admit, controverted. If he will not sacrifice his theory of wrought iron-guns (the weakest bantling, we know, is generally the mother's favourite), at all events let him put it and all its belongings into a second volume. The author's reputation and the value of his labours would be enhanced by such a course. In these remarks we have been, to a certain extent, anticipating faults which we shall have to find in a more advanced portion of the book before us. We now gladly return to the more agreeable task of pointing out what we find good, and true, and useful.

For a complete exposition of the many useful facts relating to cast iron, &c., and practical inferences from these facts, we must refer our readers to Mr. Mallet's own pages. All we can attempt is, to point out some of the most remarkable conclusions to which our author has arrived, and so stimulate the interest of our readers and induce them to apply for further information to the fountain-head.

After stating the law which fracture of cast iron-guns follows, he proceeds to state the cause, which he discovers to be the molecular constitution of crystalline bodies; this he states thus:

"*It is a law* (though one which I do not find noticed by writers on physics) *of the molecular aggregation of crystalline solids, that when their particles consolidate under the influence of heat in motion, their crystals arrange and group themselves with their principal axes, in lines perpendicular to the cooling or heating surfaces of the solid; that is, in the lines of direction of the heat wave in motion, which is the direction of heat pressure within the mass.*"

In illustration of this law the author adduces several experimental facts which might very readily be verified by the experimental philosopher. The most remarkable and startling of these we cite:—"If a cylinder of lead, of some four or five inches long, and about the same in diameter, be cast around a cylindrical bar of iron, of about 1½ inches diameter and some two or three feet long, the lead, on becoming cold, and rapidly consolidated by the contact of the cold iron bar interiorly, will have a rapidly homogeneous structure; it may be cut into, beaten out, &c., without presenting any trace of crystallization. If, however, one of the projecting extremities of the central iron bar be now placed in a furnace and heated red-hot, and time be given until the heat conducted along the bar, and from it passed into the interior parts of the lead cylinder, and thence transmitted outward radially through it in all directions, shall have raised the temperature of the lead itself to within a few degrees of the melting point—say to about 550° Fahr.—and the lead be now struck sharply with a hammer, the whole mass will be found to have assumed internally a crystalline structure, all the principal axes of the long thin crystals radiating regularly outwards from the axis of the cylinder to its surface; and by a few blows of the hammer, the whole mass will separate and fall to pieces as a metallic dust, so complete are the planes of the separation of the crystals."

In accordance with the above law, it is stated that, "in castings of iron the planes of crystallization group themselves perpendicularly to the surfaces of external contour." As a consequence of this law, the author infers "that *every abrupt change in the form of the exterior—every salient and every re-entering angle, no matter how small, upon the exterior of the gun or mortar,* is

attended with an equally sudden change in the arrangement of the crystals of the metal, and that every such change is accompanied with one or more planes of weakness in the mass," these planes of weakness being those in which the crystals "join and interlace confusedly," and are situated at the angles of the castings. It should be mentioned that the well-known fact of the failure of the bottom of the cast-iron cylinder of the hydraulic press, made use of for the purpose of raising the tubes of the Britannia Bridge, and the substitution of another cylinder with a bottom more rounded, and which was found strong enough for the purpose, are cited in proof of this law, and certainly seem to afford it considerable corroboration.

The crystalline structure, and the greater or less degree of weakness of cast iron are, of course, materially dependent on the several physical conditions to which the mass is subjected in moulding and casting, and these are investigated and minutely pointed out in the work before us, to which we refer our readers for the author's views, as also for his account of the "abnormal strains introduced by the consolidation of one portion of a casting before another," the effects of which are distinctly traced. The author has made experiments upon "cylindrical shafts of cast-iron cast vertically under heads gradually increasing up to fourteen feet in depth;" and has tabulated "the results whence the great value of increased head" is readily inferred. Nor is this portion of the work without valuable remarks on the quality of metal most serviceable for guns, which he concludes with a table exhibiting a "General Classification of the Principal Makes of British Cast-iron, as applicable to Artillery."

We have also an able exposition of the causes of liability to bursting in firing red-hot shot, and the nature and effects of local expansion by shot in guns, in which we find a distinct intimation that it is "the *enormous strain produced locally upon the exterior portions of the metal of the gun in the neighbourhood of the charge, by the expansion of the interior of the chase or bore due to the rapid communication of heat from the shot,"* to which we must ascribe the liability of guns under such circumstances to burst, and in this verdict we fully agree.

In this and the several other questions of importance and interest of which those cited above will give our readers some notion, Mr. Mallet has availed himself skilfully of all the sources of information at his disposal. Equally instructive is the information which he produces with respect to the use, manipulation, and molecular construction of gun-metal and bronze. Our limits forbid us to quote from this portion of the work more at large. We must content ourselves with assuring our readers who feel an interest in these questions, that they will find this section of the book replete with instruction. On the 169th page is given a recapitulation of the chief conclusions which the author has arrived at. We have already glanced at several of them; and as it is not our intention, as it would not be within the fair compass of a review, to give a complete analysis of the book, we dismiss this part of our subject by expressing a hope that what we have said may be sufficient to prove to the metallurgist that a perusal of the volume would well reward his labours.

(To be continued.)

DR. BAGOT'S NEPHELESCOPE.

At an evening scientific meeting of the Royal Dublin Society, held on the evening of Friday the 2nd inst., Professor Harrison in the chair, Doctor Bagot read a highly interesting paper calling attention to the movements of the upper strata of the atmosphere, and described an instrument which he had invented for the purpose of observing the motions of the clouds which float in those lofty regions. This instrument he entitled a nephelescope. He had read a paper before the society on this subject at the evening scientific meeting held on May 24, 1849, an abstract of the communication being printed by the society in the same year. In that paper he had called attention to the necessity of a strict investigation of the direction of the currents of air which moved at considerable elevations, as a probable means of predicting the course which the wind (commonly so called) would assume after some unascertained period had elapsed. This subject, he believed, was at that time entirely new to meteorologists, except in so far as it had been observed that the upper and lower currents of the atmosphere frequently moved in contrary directions, whereas, Dr. Bagot had especially remarked, "That it would, perhaps, be found that when we have had a long continuance of wind from one point, the first indication of a change in its direction would be found among the upper currents of the air, and that he had had many opportunities of investigating this interesting phenomenon." He had also given a case in point in which "the upper and lower currents of the atmosphere having for a considerable period been opposed in direction, the under current had, during a shower, taken the direction of the upper, but had assumed its original course immediately on the cessation of the rain."

Dr. Bagot then said he had been surprised at seeing the same facts put forward in a

paper contained in the *New Philosophical Journal*, published in Edinburgh last year, from the pen of Mr. Thomas Stephenson, F.R.S.E., C.E., which purported to be an original article. He thought the extreme similarity between the papers would be apparent to every one, the only point of difference being that he made his observations *direct* on the clouds, whilst Mr. Stephenson watched them in a mirror. This plan of surveying the clouds in a mirror seemed to Dr. Bagot very objectionable, as it was impossible with a horizontal glass to get a view of the zenith. His nephelescope was, he thought, if only from its simplicity, much more available for observations on the clouds. It consisted of a circular piece of plate glass, on which were painted sixteen points of the compass, with lines connecting the opposite points, all meeting at a common centre. By fixing this into a frame-work, or in the top of a hut, with the N. set to true north, the observer sitting under it with his head resting on the back of a chair (to insure an immovable position to the eye) the motion of any cloud might be carefully viewed and its direction ascertained, by noting with which line of the instrument its movement corresponds.

In conclusion, Dr. Bagot said—With regard to priority of observation of the upper currents of the atmosphere, I leave myself in the hands of the society. I cannot but think that such observations, made in connection with the oscillations of the barometer, may yet prove of considerable importance, and perhaps assist in rescuing this instrument from the obscurity under which it at present labours in its capacity of weather glass. For instance, I find that last week there was the extraordinary fall in the column of quicksilver of about one inch within twenty-four hours, and yet, instead of a violent hurricane or torrents of rain, we had an intense frost and a dry atmosphere. I trust the subject may be taken up by those who have more time to notice it than I have, and I believe my nephelescope, from the simplicity of its construction, will materially contribute to its elucidation.

SUBMARINE ELECTRIC TELEGRAPHS.

A paper on submarine electric telegraphs was read at the Institution of Civil Engineers, January 13, 1857, by Mr. F. R. Window, Assoc. Inst. C.E. In a brief relation of the early history of the Submarine Electric Telegraph, it was stated not to have been the invention of any one person, but rather the result of the combined researches and exertions of many experimenters.

It was stated further that it was entirely owing to the energy and skill of Mr. Crampton, who undertook the responsible task of carrying out a scheme, up to that time looked upon with distrust by some of the leading engineers of this country and France, and believed by the public generally to be impossible, that the world was now indebted for the benefits of Submarine Telegraphs; and the leading circumstances of the case were briefly explained. The author then proceeded to give a detailed account of the construction of the Dover and Calais cable, which was the first laid down; and the system of construction of all the principal submarine telegraphs in Europe up to the present day, with all particulars relative to them, was shown in a comparative table.

The author discussed the respective merits of the compound cable system, or the collection of many insulated wires into one cable, as in the Calais and Ostend telegraphs; and the simple cable, containing but one wire, as in the lines of the International Telegraph Company to Holland and Ireland: the greater facility which these latter afforded for repair, and the less chance of having the business stopped by rupture, since one wire only, and not all, would be affected by the cause, were pointed out; and it was shown that the cost of the two systems did not materially differ.

The conductive power of submerged wires was then theoretically investigated, and it was shown that a considerable difference as to time, existed between the transmission of signals upon suspended wires, and upon insulated wires immersed in water, or buried in the earth.

Upon the longest line yet constructed the inconvenience arising from the retardation of the current in submarine wires was not very great; it was not until the line was prolonged to upwards of 700 miles that the retardation became a serious obstruction. It was argued, from some experiments that were made at Lothbury by Mr. Latimer Clark, upon 1,600 miles of subterranean wire, that signals upon the line which was about to be laid down between Ireland and America, would require about 2½ seconds to arrive at their destination, and that after each signal, another 4½ seconds must elapse before the line was free to receive another electric wave. Each word of average length would thus occupy about a minute; and each dispatch of twenty words, would, with the necessary code signals, and unavoidable repetitions, require about half-an-hour, thus making the limit of possibility about fifty messages in twenty-four hours.

The author argued, that since submarine lines were more costly than suspended lines, and nevertheless a smaller amount of busi-

ness could be sent along them in an equal time, it was important that no pains should be spared, whereby this lateral induction, and consequently the evils arising from it, might be reduced, though, being in accordance with a law of nature, it could not be entirely avoided.

WESTHORPE'S IMPROVED SERVING MALLET.

(Registered under the Act for the Protection of Articles of Utility.)

It is curious in this age of universal improvement to observe the primitive simplicity of the tools and processes which still prevail in many important manufactures. This is attributable, no doubt, to the circumstance of the manipulations being little known except to the trained operators, whose introduction to the process in early life has formed habits (a kind of second nature) so completely accustomed to one line of working and thinking as to preclude the idea of any part of the process, or of the apparatus employed, being susceptible of any possible improvement. A remarkable illustration of this state of things is furnished by the *serving mallet*, in use time out of mind by riggers for serving or covering ropes with yarn or line. The implement heretofore employed for this purpose consisted of a cylindrical wooden mallet fitted with a handle; the front or face of the mallet had a groove or indent for the reception of the rope to be covered. The mallet being placed with the groove upon the rope, the line with which it is to be covered was wound several times round the rope and mallet, enclosing the two, and then round the handle of the mallet, the grasp of the workman's hand upon which, regulated the amount of strain given to the line. Considerable pressure was thus given, and the line wound tightly round the rope by traversing the mallet. Just in proportion to this pressure was the surface of the rope and of the covering line extracted, and the tar scraped off the surface, practically a serious drawback on the operation.

Mr. Theophilus Westhorpe, the well-known rigger, of Limehouse, has lately invented and registered an Improved Serving Mallet, and thereby introduced a most important improvement in this department of his business. It consists of a serving mallet formed by seven metal rollers mounted in a suitable frame, and furnished with the usual handle. Fig. 1 is a front view; and fig. 2 an end view of this instrument, which is used in precisely the same way as the old ones. The rope being laid in the groove on the face of the mallet, the line is wound several times round the rope and the mallet, and then round the handle, to regulate the strain. The consequence of this arrangement is, that a very consider-

Fig. 1.

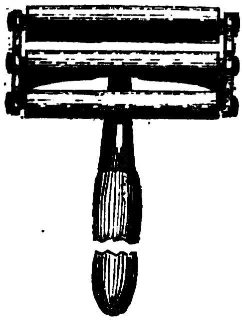
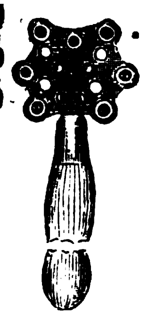


Fig. 2.



able pressure is easily obtained, which in the first instance rolls and smooths over the surface of the rope, and then pays over the line, which is drawn very tight, and by the action of the rollers is rolled perfectly smooth, the tar, instead of being scraped off, being evenly spread over the surface. It is almost impossible to give any idea, to persons unacquainted with the operation, of the superiority of the work produced by the new mallet; comparison is altogether out of the question. Judging by the results, it might well be supposed to be the effect of an entirely different operation. This highly ingenious and skilful adaptation of mechanical principles to a simple and every-day operation will prove invaluable to the navy and mercantile marine.

EXPERIMENTS WITH BESSEMER'S IRON PROCESS.*

Several experiments have been recently undertaken on the large scale at the Dundyvan Iron Works and Coats Malleable Iron Works, near Glasgow. The furnace employed at Dundyvan was composed of iron, lined with fire-clay, and it was charged with 13 cwt. 1 qr. and 8 lbs. of No. 2 pig-iron, whilst the air (cold blast) was forced in under a pressure of 15 lbs. on the square inch. The iron commenced to boil immediately, followed by sparks and flame, and the production of much slag or cinder, which caused the furnace to overflow occasionally. The blast was continued for eighty-nine minutes, during which time the scintillations, jets of flame, and slag continued to be evolved. The furnace was tapped, and the iron run into moulds. The

* From the Official Report of a paper read by Dr. Stevenson Macadam, F.R.S.E., at the Royal Scottish Society of Arts.

quantity of metal found in the moulds was only 3 cwt. 3 qrs. 2 lbs., which, added to that thrown out during the operations, viz., 1 cwt. 3 qrs. 12 lbs., gives 5 cwt. 2 qrs. 14 lbs. as the entire weight of pure iron obtained from the experiment. It may be mentioned that, after half an hour, the pressure of air gradually decreased to 5 lbs., owing to the enlargement of the mouths of the tuyeres, but the latter pressure was still found sufficient to penetrate the molten mass. The time employed in this experiment was unnecessarily long, and undoubtedly was the cause of so much of the iron being burned away. The loss was nearly two-thirds of the original amount, being, in round numbers, 8 parts out of 13. The iron obtained was very crystalline and brittle, and, when attempted to be rolled, at once proved itself to be *hot short*. An attempt was made to anneal this iron, by raising it to a red heat, and then very slowly cooling it; as also by keeping the mass at a red heat for sixty hours, and then lowering the temperature very gradually; but both attempts failed in giving other than a highly crystalline and brittle product. At Coats Malleable Iron Works, a circular furnace, built of fire-brick, was employed, which was charged with 7 cwt. of No. 1 pig-iron. The cold blast, under a pressure of 12 lbs., which decreased to 5 lbs., was forced through the metal for thirty minutes. The usual display of sparks, flame, and slag was observed, and the furnace being tapped, the iron ran into moulds. The product or *bloom* was highly crystalline and brittle when heated and rolled; as also, when reheated and rerolled, the rods obtained from the first and second rollings still retained this crystalline and brittle character. This iron was *cold short*. Another trial with No. 1 pig-iron, subjected to a stream of air for twenty-four minutes, gave a similar result; the successive rollings not yielding an iron of a tough character, or fibrous texture. It is worthy of consideration that the quality of pig-iron used in these experiments was "No. 1" at Coats, and "No. 2" at Dundyvan. These varieties are more fusible than the others, contain more carbon, command a higher price in the market, and are generally used by the founder, and not by the puddler. The varieties "Nos. 3 and 4" are generally used in the conversion of pig-iron into bar-iron. One trial has been made at Coats on No. 4 pig-iron, but in fifteen minutes the metal settled down in the furnace; and though it was immediately tapped, yet the iron did not run off, and the furnace was taken to pieces to liberate its iron prisoner.

To a certain extent, the ordinary refinery furnace is the equivalent of the Bessemer furnace, as it is quite possible for all the impurities contained in pig-iron to be got rid of in the refinery furnace, with the single exception of the carbon. Moreover, when the pig-iron is placed in the Bessemer furnace for a short time, in place of the ordinary refinery, and thereafter introduced into the puddling furnace, a very superior bar-iron is the result, as proved by an experiment conducted on a somewhat large scale at Coats Malleable Iron Works.

TABLE OF THE RELATIVE FREQUENCY OF OCCURRENCE OF THE CAUSES OF BREAKING OF PLATE GLASS WINDOWS.

[The following Table has been prepared by an eminent statistician, from a detailed list of breakages, extending over ten months, recently published in the *Times*. It will be of value in many respects, and will, we hope, induce others to furnish more extensive collections of similar and related facts.]

1. Air gun	1
2. Window sash warping	1
3. Frost	1
4. Crowd	1
5. Frame badly made	1
6. Dog	1
7. Slate from roof	1
8. Bottle of soda water burst	1
9. Cart shaking window	1
10. Door opening causing package to fall	1
11. Iron bar falling	1
12. Board falling	2
13. Shutting window	2
14. Rioters	2
15. Dressing shop window	2
16. Men repairing the road	2
17. Thieves entering premises	3
18. Stones kicked up by horses or cattle	3
19. Persons throwing various things	3
20. Sash rope of window breaking	5
21. Opening shop	5
22. Package in window falling	6
23. Cord or hook of fanlight giving way	6
24. Settlement of building	7
25. Horses, sheep, or cattle running against	7
26. Blind falling	9
27. Opening door too wide or violently	9
28. Cart, carriage, or truck ran against	10
29. Wilfully (three imprisoned)	12
30. Slamming door or window	12
31. Drunken men, women, or boys	14
32. Gas	15
33. Cleaning windows	16
34. Boys throwing stones at each other	16
35. Men fell through	18
36. Pushing against it	19
37. Violence of wind	32
38. Shutter falling	43
39. Pair of steps or other things falling against	50
40. Persons throwing stones	55
41. Unknown	68
Total	464

THE SWEDISH DIFFERENCE ENGINE.

With much satisfaction we are able to announce that the difference engine of Messrs. Scheutz, of Stockholm, has been purchased for the sum of £1,000, by Mr. John F. Rathbone, an enlightened merchant of the city of Albany, U. S. This gentleman has most liberally presented it to the Dudley Observatory—(recently established in that city by the munificence of the widow of another American merchant, Mr. Dudley)—at an expense of about £10,000. These splendid gifts from their fellow-citizens will be fully responded to by the scientific colleges in the West, and will, we are confident, soon be made available for works of observation and calculation. We trust also that the purchase of the machine will have the effect of materially facilitating the studies and labours of the inventors, and enable them to advance still further in the art to which they have for many years so nobly devoted themselves.

BOVILL'S FLOUR-MILL PATENT.

COURT OF QUEEN'S BENCH, JAN. 14 & 15.

Sittings in Banco, before Lord Campbell, and Justices Coleridge, Wightman, and Erle.

BOVILL *v.* KEYWORTH AND OTHERS.

Mr. Knowles, Q.C., Mr. Bovill, Q.C., Mr. Webster, and Mr. G. Denman appeared for the plaintiff; Mr. Atherton, Q.C., Mr. Hindmarch, and Mr. Manisty for the defendants.

The former trial, resulting in a verdict for the plaintiff, was reported at page 78 of our sixty-fifth volume (No. 1720), in conjunction with a description of Mr. Bovill's machines. A rule was subsequently granted to enter the verdict for the defendants.

Lord Campbell, after conferring with the other judges, said that with respect to the verdict being against the evidence, he was of opinion that the rule should be discharged. It was clear that Mr. Bovill (the plaintiff) was the inventor of this process, by which the grinding of corn had been most materially improved. There could be no doubt that the plaintiff was the meritorious discoverer of the process. Still, if it was in previous use, though without his knowledge, the patent could not be sustained; and, to show that it was so, reliance was placed on Mr. Muir, the owner of the Tradeston Mills, near Glasgow. The evidence on that point was conflicting, and it was for the jury to decide which side they would believe. No complaint was made of the manner in which the question was left to the jury who had decided in the plaintiff's favour. He (Lord Campbell) could not say that they were wrong. On looking at the conduct of Muir and Gordon, his Lordship thought that their evidence was open to the greatest suspicion. His Lordship must say that where there had been an invention and an attempt was made to defeat the patent by a prior use of that which had been abandoned, the prior use of the invention ought to be made out very satisfactorily.

Mr. Justice Wightman and Mr. Justice Erle expressed similar opinions.

Lord Campbell said that as to the objections which had been taken in point of law, the Court would take time to consider, and in giving judgment, would state whether, after examining the question of damages, there ought to be any substantial reduction.

FREE REVOLVER STAND FOR ASTRONOMICAL INSTRUMENTS.

Professor C. Piazzi Smyth recently read a paper for the Royal Scottish Society of Arts, detailing the results of experiments that had been made by him with the above stand for instruments. With the "naval dinometer," the laws of the rolling and pitching of the yacht *Titania*—(nobly placed at the author's disposal for the purpose of the astronomical expedition to Teneriffe, by Robert Stephenson, Esq., M.P.)—were ascertained; and some interesting particulars were arrived at respecting the effects of single and compound swells, calms, and squally weather, more particularly respecting the continuous growth of the trade wind influences. With the "free-revolver stand," carrying a telescope, and mounted within an observatory-box, the experiment was made, and with the most perfect success, of eliminating the effects of the rolling and pitching of the vessel, for the horizon line of the sea being brought into the field of view of the telescope, and bisected by the wire, remained bisected for many minutes, even when the rolls of the yacht amounted to 20 per minute of 12° each. The experiments were continued with similar success for several days in the seas about Madeira, until one of the axles of the driving-wheels gave way.

LANDALE'S PUMPING ENGINES.

At a meeting of the Royal Scottish Society of Arts, held on Monday, 12th Jan., 1857, the final report of the Prize Committee was read, and the Brisbane prize delivered to David Landale, Esq., mining engineer, Edinburgh, for his "New and Improved Arrangement of the Direct-Acting Pumping Engine, adapted for Deep and Heavy Pumping," devised and introduced by him into Scotland, where it is now

in most successful operation at various collieries, and is found to be attended with great economy, both in the first cost and working expenses, besides possessing other important advantages; also for his description and drawings, which had been furnished to the society.

THE BELL AND CLOCK FOR THE HOUSES OF PARLIAMENT.

To the Editor of the Mechanics' Magazine.

SIR,—Natural history tells us of an animal called the squash, which has a method of fighting at once so offensive, repulsive, and inglorious, that most persons, out of regard for their reputation, and the taint which the creature leaves behind, feel somewhat ashamed of being engaged in a contest with one of them. Most persons are also aware of the kind of weapons to which barristers will sometimes resort, when pleading for hire in a court of law, by charging the witnesses with all the culprit has been guilty of; and Mr. Denison, Q.C., has shown for several years past that he does not lay aside the weapons peculiar to the special pleader, when he doffs his wig and gown, and puts on the dress of an honest, working clockmaker; the fact of his having charged me with "fabrication," "absurdity," "blundering," "falsehood," "folly," and "malice," without his having been able to adduce any proof in support, need, therefore, excite but little surprise in the mind of any one acquainted with his tactics; and those who witness them now for the first time will probably not be long in perceiving to which side his epithets and charges properly apply.

In his first letter I perceived portions of irrelevant matter had been introduced, probably for the purpose of diverting attention from the principal points, and I therefore concluded my reply by setting forward the questions to be kept in view; but Mr. Denison again evades them in his second letter, and prefers to lead the discussion into other channels; and if I now follow him, it must not be understood that I accept the points substituted by him for anything beyond their real value, or have failed to perceive the object for which they were introduced. One of the most amusing of these diversions is that in which Mr. Denison connects my name with obstructing improvement, and his own with advancing it, and sets me the task of defending Mr. Vulliamy's plan in other particulars, besides that of durability; calling my attention, amongst other things, to the fact of the hours being struck from the second wheel instead of the first, but omitting to mention that his own plan has the same fault of striking from the second wheel in the quarters that Mr. Vulliamy's had in the hours, and that the quarters will have considerably the most work to do.

Once for all, let me state that whatever merit or fault Mr. Vulliamy's plan possesses, I cannot accept either the credit or blame, because I have never had anything to do with the design; and in order to show which side the charge of obstructing improvement really belongs to, I need only observe, that in none of the instances in which my own improvements in horology have been submitted to the many Government trials they have successfully undergone, have I thought it necessary to constitute myself the judge to decide on their merits; whilst, on the other hand, this is the course which Mr. Denison has systematically adopted, first during the Exhibition of 1851, when he got himself elected chairman of the jury, and awarded the principal medal to his own design; second, in getting himself appointed the joint referee for his design of the Westminster clock; and afterwards setting aside the other referee, by conducting the business in a manner which caused the Astronomer Royal to decline acting with him any longer; and, lastly, in getting himself appointed referee to decide on the merits of his bell, and in this last instance he has already shown the use he intends to make of his appointment, by instituting, as a fair test, that same clapper trial of the bell, in which he employed eight or nine men to exert at least twelve times more force than the clock is equal to.

My reply to the points he has numbered 1, 2, 3, 4, and 5, is this:—That in referring to the table of bells and hammers in my last letter, I distinctly stated it was by the late Mr. Dent, and gave ample directions for finding it with all its details: and it is therefore characteristic of Mr. Denison to charge me with attributing some of the figures it contains to him, and concealing other portions from the public. I was aware that the bell for which Mr. Dent intended the hammer of 120 lbs., was only half the weight of the present one; but, in addition to the fact of the Oxford bell being struck by less than half the force, I had also to keep in mind that when Mr. Dent allowed this proportion of force, he expected to have had to use one of our degenerate modern bells, because the *Times* had not then announced Mr. E. B. Denison, Q.C., to the world as a distinguished lawyer specially raised up by Providence to restore the art of bell-founding, and discover improvements in turret-clocks; but if, after all, Mr. Denison is content to come down to the standard of the modern bell-founders, against whose productions he

has had so much to say, and confess himself no prophet in the art, but only an amateur in the first agony of reducing his theory to practice, there would be no objection, so far as the bell alone is concerned, to allow him an equal proportion of force; but his lowest demand at present is for eight times the proportion required by the Oxford bell, instead of only twice: and I have already shown that the clock would be quickly worn out by even twice the force, and that 120 lbs. for the hammer and 6 inches for its fall, is the greatest quantity of work it should be allowed to do.

There appears to be some difference of opinion between us as to whether certain qualities in bells should be considered good or bad; for instance, I have held the notion that the best bell would be that which should produce the finest quality of tone and the greatest volume of sound with the least blow and the lightest weight of bell; Mr. Denison takes the opposite view, and forthwith condemns the Oxford bell as the worst large bell in England, on account of it only requiring a light blow, at the same time modestly setting up his own bell as the standard; and if this standard be correct, my notions are certainly wrong; for the Westminster bell differs from them very materially.

I stated, in my last, that Mr. Denison had so managed matters that the Government would have to pay as much for the cast-iron clock as though it had been made of gun-metal; and I perceive that he has now added a few words which pervert the sentence. My reason for the statement was not on account of any estimate from Mr. Vulliamy, as Mr. Denison makes it appear, but because Mr. Dent had actually agreed to construct the clock with gun-metal wheels throughout for the sum of £1,600, until Mr. Denison arose and got the original estimate set aside, the material altered from gun-metal to cast-iron, and the contract increased to £1,900. All this appears so clearly in the parliamentary returns, that I did not consider it necessary to add any explanation at the time. E. T. Loseby.

London, Jan. 10, 1857.

THE ROYAL CORNWALL POLYTECHNIC SOCIETY.

To the Editor of the Mechanics' Magazine.

Sir,—Observing the letter of "Cosmopolitan," in your number for Jan. 3, 1857, in which he points out the causes that have a tendency to produce, not only the decline, but also the decay of (so-called) scientific institutions, we desire to state that he has struck at the root of the evil. The fault is in the committees who are, from local peculiarities, not in a position to take large or comprehensive views of management, and very seldom carry out any but half-measures (certainly never adapt the management to the requirements of the ever changing period), under which circumstances *progress* is impossible.

The subscribers who support the Royal Cornwall Polytechnic Society are reduced to the deplorable position of observing with dismay (and over a period of many years), the uniform poverty of results with respect to the *awards*. "Great cry and little wool" appears to constitute the vilifying characteristic of this miserable dummy of an institution. It does seem indeed quite incomprehensible, how the committee (or some few who act for them) can have the assurance to rest any claims for local support upon the presumed assistance it has rendered *inventors generally*, and the *Cornish mines in particular*. It is simply absurd for any society, with only about fifty pounds per year for awards, to pretend to encourage (?) such a multitude of different arts and sciences; but to parade a list of premiums and prizes annually (without having funded the full amount promised as rewards) is not only very questionable, but calculated to injure the very class of poor men it is pretended to serve. The Cornish mechanics and the stranger from a distance have so often been out of pocket by sending their productions for competition, in the hope of a reward from the Royal Cornwall Polytechnic Society, that very few will now venture to incur certain loss. It also indicates a very rotten state of management, when a proportion of the small funds is expended in collecting pictures, with the view just to make up a show. It seems (to all appearance, at least) to be a wide departure from the intentions of the subscribers, and consequently the objects of the Society cannot, for many years past, have been carried out upon principle. The committee representing the Society is worse than useless, and the sooner a reform takes place, the better chance will exist for progress.

With respect to the interference with intelligent mine agents, and the ventilation of Cornish mines, it is a positive evil to all concerned. The mines which subscribe about fifty pounds per year to carry out the objects of mine ventilation have small advantages for the sums invested for that specific object, as the reports of the Royal Cornwall Polytechnic Society for many years past, will demonstrate. Perhaps it would be a step in the right direction, if the committee would hand over all their pretensions, &c., on the subject, to the captains of Cornish mines, who are better qualified to appreciate any practical plan sent in for competition. Although the mine agents are in possession of some fifty very admirable

plans already, and some that are regulated by natural means, and which are as near perfection as possible, they have been produced quite independently of the Society.

To persist in this "great card" of the committee is very like endeavouring to teach their "grandmother to" &c., and does not reflect much credit on the Royal Cornwall Polytechnic Society, or the small party that manages the so-called Institution.

We are, Sir, yours, &c.,
THE VICTIMS.
Cornwall, Jan. 9, 1857.

TONNAGE AND SHIPPING REGISTRATION.

To the Editor of the Mechanics' Magazine.

SIR,—In a letter which Mr. Atherton wrote to you last week, he accuses me of "singularly disregarding my own precepts" in announcing my views in opposition to his letter to the *Times*. This comes with a singularly bad grace from a gentlemen who thought it within his duty as a member of the Committee to address to the *Times* an exposition of his own individual views, and thus gave rise to the discussion. It is not convenient that a question under the consideration of a committee should be discussed in the public papers by individual members. I should never have come forward, had I not been under the apprehension that the public might look upon Mr. Atherton as the organ of the committee. Of course, I could be under no such apprehension on my own account; nor would my object have been answered by a simple disclaimer of Mr. Atherton's authority in this respect. The whole tenor of his letter—especially when taken in connection with his paper read before the Society of Arts—seemed to me, and, I have no doubt, to the generality of persons interested in this question, as aiming at the substitution of some more perfect system *in the place of* "the present delusive system of registration." When once provoked to take up my pen, I could not remain satisfied without showing to the shipping interests that more moderate opinions were entertained by at least one of the members of the Committee; for I have had as yet no means af knowing the opinions of others, and can answer only for myself. A simple disclaimer could not possibly have tended to allay the apprehensions and opposition of the shipping interests, which I thought, rightly or wrongly, a point worth gaining.

I am, Sir, yours, &c.,
JOSEPH WOOLLEY, LL.D.
Portsmouth Dockyard, Jan. 20, 1857.

To the Editor of the Mechanics' Magazine.

SIR,—Referring to your Editorial remarks on Tonnage and Shipping Registration in your last week's Number (1745), pages 55 and 61, I beg to observe, that I regard my original paper read before the Society of Arts, January 16, 1856, and published in the Society of Arts Journal, as the text of my opinions. Your readers, on examining that paper, have doubtless perceived, without any indoctrinating on my part, a wide difference between my own version of my opinions, as expressed in my own words, and that which has been attributed to them, and which, permit me to say, appear to me to have misled you, and recognise a close analogy between my summary of the *deficiencies* of the present law, as set forth in the last clause of my paper, and the declarations of opinion at which you gradually arrived, as quoted textually in my letter of 24th September last, thereby closing a discussion which I am not disposed to renew.

I am, Sir, yours, &c.,
CHARLES ATHERTON.
Woolwich Dockyard, Jan. 20, 1857.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BRAGG, H., jun. *Improvements in machinery or apparatus for finishing linen and other fabrics.* Dated May 14, 1856. (No. 1131.)

This invention consists—1. In so arranging double-acting machinery for finishing fabrics, by the compression of flat surfaces, that the weight of one descending portion of the machinery is made available for elevating another, the two ascending and descending alternately. 2. In the application of an intermediate table, between the compressing flat surfaces, for finishing two folds of different fabrics at one operation; or for imparting the same finish to both surfaces of the same fabric. 3. In single-acting combination of machinery for finishing fabrics by the application of pressure. 4. In supplying and removing fabrics in continuous lengths to and from machines for finishing by the compression of flat surfaces.

GALLOWAY, W. and J. *Improvements in machinery for rasping, cutting, and chipping dye woods.* Dated May 14, 1856. (No. 1132.)

The peculiar feature in this machine is the periphery of the wheel or drum in which the knives, rasps, or cutters are placed, and which is of an angular form. The dye wood is advanced through a box or trough upon this so formed periphery, with its knives, cutters, or rasps, and is consequently acted upon obliquely, instead of "end on."

GROVES, H. *Improvements in tune barrels or cylinders, or other apparatus for playing upon organs or other musical instruments.* Dated May 14, 1856. (No. 1133.)

This invention consists—1. In construct-

ing the parts of such barrels, &c., which are intended to act immediately upon the keys or stickers of the instrument (to produce the tunes) of pieces of metal (or other material), on which grooves, notches, or cuttings are made to correspond with the notes required. 2. In constructing the tune-pieces with bayonet catches for locking them upon the framing, and the framing with studs for fitting into such catches. 3. In constructing the said framing of the form of an ordinary reel, or of an open or skeleton form, the carefully-turned barrel hitherto in use being rendered unnecessary.

DRIEU, J. A. *Improvements in weaving horse-cloths, blankets, rugs, or similar thick materials.* Dated May 14, 1856. (No. 1136.)

This invention consists in using an extra floating warp of fibrous materials, and of confining the said warp to the interior of such goods, still preserving a woolen face on both surfaces, by which process the consumption of warp or weft is not increased.

SCOTT, U. *Improvements in public carriages, and various parts of the same, which parts may be used separately, and applied to vehicles of any description.* Dated May 14, 1856. (No. 1138.)

These are improvements in omnibuses, and consist—1. In placing one seat behind another. 2. In combining felt or India-rubber with metal or earthenware in making bearings and axles, so as to prevent vibration. 3. In making the fore part of a carriage with a large wheel or turn-plate and semicircular springs, so as the wheel can work up through the centre, and to use only one wheel in front of a carriage. 4. In making the wheels, &c., with India-rubber or similar material, to make them elastic. 5. In making springs in combination with felt, leather, and metal, so as to prevent noise.

HARDING, G. P. *An improvement in the manufacture of cloth bonnets.* Dated May 14, 1856. (No. 1139.)

This invention consists in manufacturing cloth bonnets, without stitching or sewing, by blocking cloth into any desired form, and then cementing it on to a corresponding shape.

MEILLET, A. *An improved artificial stone for grinding, sharpening, and polishing.* Dated May 14, 1856. (No. 1140.)

This invention consists in the employment of emery, combined with a compound of siliceous earths and plumbiferous or alkaline substances, for the manufacture of artificial mill-stones, &c., &c.

GIBSON, C. *Improved machinery for the manufacture of bricks, tiles, pipes, and other articles made of clay or plastic materials.* Dated May 14, 1856. (No. 1142.)

The clay (or plastic material) is supplied to the moulding part of the machine, either by a pair of feeding rollers or by a pug-mill, and is then forced into a chamber in which is placed a reciprocating box, open opposite to the feeding aperture, and at each end. This box has a central partition dividing it into two compartments, which are alternately brought opposite to the feeding aperture. The moulds or dies are brought opposite to one of the exit apertures of the mould chamber; and upon communicating motion to the reciprocating box, clay is drawn forward direct into the mould, or, by means of a piston, is forced into moulds or dies placed beneath suitable openings in the mould chamber.

CROFTS, W. *Improvements in the manufacture of lace and other weavings.* Dated May 14, 1856. (No. 1143.)

The improvements relate to means of manufacturing various weavings in looms of the character ordinarily employed in the production of bobbin-net lace, and so that lace and other ornament may, when desired, be interspersed or combined with such weavings.

HARFIELD, W. H. *Improvements in machinery for cutting and smoothing the surfaces of metallic nuts.* (A communication.) Dated May 14, 1856. (No. 1144.)

A rotary wheel or disc, having cutters on its under side, is mounted on an upright shaft, provision being made for pressing such wheel or disc into action by a spring coiled round the shaft. The nuts are placed on pins fixed to the links of an endless chain, which receives motion from chain wheels. The part of the chain which is, for the time being, uppermost, is supported at the bottom of a grooved or bent plate fixed on a grooved table. The groove of the bent plate has inclined sides. The nuts, as they are moved by the chain under the wheel or disc, are sustained by two plates, one on either side of the groove, and are guided by the edges of two other plates, which are adjustable for different sizes of nuts.

EVANS, W. *An improved description of plough.* Dated May 14, 1856. (No. 1145.)

The patentee describes an implement (called a parer) to be employed (as a breast plough is now employed) for performing the operation of paring. The features of novelty are—1. The share of the implement (which is somewhat similar to a plough) has a coulter in the land side thereof. 2. The point of the share is placed as far forward as the centre of the two fore wheels. 3. The turn-furrow springs immediately from the point of the share, and is of such shape as to leave the furrow hollow on the ground in the form of a half tube. 4. Both the arm which holds the share and the under

edge of the turn-furrow are arched, so as to run clear of the ground from the edge of share to the heel or edge of the parer; such arching serves also to prevent them being thrown out of the ground upon coming in contact with a stone, and also prevents choking.

COX, J. *Improvements in coke and coke-ovens.* Dated May 15, 1856. (No. 1146.)

This invention consists in the application of non-absorbent bottoms or floors to coke-ovens, which shall admit of the coke being purified from the sulphur and phosphorus by which it is contaminated, by pouring water over it whilst in a red-hot state in the oven, without the bottoms or floors absorbing or retaining a portion of the water so used, and becoming injured thereby.

NORRIS, W., and R. KING. *Improvements in anchors.* Dated May 15, 1856. (No. 1148.)

The patentees form the shank of Porter's or swivel anchors of edge pieces or flat bars of iron, which they weld together at the stock end, and through which welded portion they form laterally an oval hole for the stock, in a round hole for the ring or shackle bolt. The edge pieces forming the shank spread slightly from the point at which they are welded, so that at their lower or crown ends they are sufficiently apart to admit of edge pieces of which the anchor arms are formed, being slipped in between them, and to which they are secured by a stout locking pin, upon which the arms swivel. They form the arms of plates or edge pieces, which they bring together at the points where they weld on the palms or flukes in the usual way. The edge pieces forming the arms are sufficiently apart in the centre to admit of their being slipped in between the edge pieces of the shank.

SIMPSON, J. Y., and W. THOMSON. *The manufacture or production of lubricating oil from a new material.* Dated May 15, 1856. (No. 1149.)

Claims.—1. The use of Trinidad and other asphaltum or asphalte in the manufacture of an oil or liquid for lubricating. 2. The mode of manufacturing an oil or liquid for lubricating, by combining with an animal or vegetable oil a liquid obtained by distillation from asphaltum or asphalte.

LECK, J., and A. MILLER. *Improvements in singeing textile fabrics.* Dated May 15, 1856. (No. 1150.)

This invention relates to a patent granted to A. Miller, Oct. 2, 1852, and consists of certain arrangements of the "gassing machine," as well as of certain contrivances wherein gassing and hot-plate singeing are to work in concert upon the goods.

FOULDS, R., and W. BRACEWELL. *Certain improvements in power looms constructed on what is called the loose reed principle.* Dated May 15, 1856. (No. 1151.)

Claims.—1. A small finger is applied to the back board of the stay, for keeping the loose part on the back board firm until the shuttle passes by it. When the shuttle misses "boxing," and is caught in the edge or selvage of the warp, this finger liberates the loose back board, and will prevent the shuttle being thrown out of its course. 2. A guide or conductor is provided for the shuttle betwixt the end of the reed and the back board, which guide falls back when the reed flies out. 3. This invention allows of the shuttle being loose on the box at the time of "picking:" this is accomplished by a lever connected between the crank arm of the loom and the swell in the shuttle box, which stays the shuttle by means of the swell at the time of entering the box, and also liberates it at the time of picking.

GREAVES, H. *Improvements in the permanent way of railways.* Dated May 15, 1856. (No. 1152.)

This relates to a cast-iron permanent way, and to modes of jointing rails, with a new form of rail for economising the tyre iron. 1. The patentee employs sleepers, to which the rails are secured. These sleepers are of cast iron, and, in some cases, he makes them round (with corrugations round the centre for giving strength), oval, or in the form of a ring; the concave side, in all cases, he places towards the ballast. In some cases the rails and sleepers forming one line of roadway are connected by tie-bars. To preserve the gauge and angle of the rail he casts a rib on the sleeper. 2. In securing the rails at the joints, instead of using three distinct wooden keys to a three-jawed chair as patented by him in 1852, he uses one long taper wooden key, or he uses three vertical wood wedges, also patented by him in 1852; on the fish he casts a short stud, which fits into a hole in the rail to prevent its travelling. Other jointing arrangements are mentioned. 3. To economise the iron of the tyres of the wheels, he employs an extension of a plan patented by him in 1852.

WILLIAMS, C. R. *A new or improved implement or apparatus for the cultivation of land.* Dated May 15, 1856. (No. 1153.)

In this apparatus a series of prongs or blades are caused, by the advancing motion of the carriage on which the apparatus is situated, to descend into the ground with an advancing motion, and, after ascending, to redescend into the ground at or near the point where they previously left it.

MOORE, S. W. *Improvements in dividing and finishing lace goods.* Dated May 15, 1856. (No. 1155.)

Claims.—1. The dividing and finishing of

lace goods by pressing the lace between rollers, separating the parts to be divided, and carrying such parts over reels made to revolve in contrary directions until the division of the whole piece has been effected. 2. A certain described arrangement of machinery for dividing and finishing lace goods.

MARYCHURCH, W., and J. GRIFFITHS. *Improvements in horse-rakes, part of which is applicable to two-wheel carriages.* Dated May 15, 1856. (No. 1156.)

This invention consists in working the teeth of horse-rakes by the forward motion of the implement itself. The patentees find the following a good method of carrying their invention into effect:—They cause a ratchet wheel to revolve with the driving wheels, and employ a lever which, upon falling into gear, causes the onward motion of the driving wheels to raise the rake teeth, through cranks and rods, and discharge or free them from the load. A cord is attached to the lever, and carried by a person driving the horse, and when required to discharge the load, he raises the end of the lever near to him, so that tongues upon the opposite end may fall into one or more of the teeth of the ratchet wheel, when they are immediately secured by the onward motion of the implement, and pressed forward, turning at the same time a crank, a bar, and other cranks which elevate a bar and raise the teeth. When in this position, the back of the next tooth of the ratchet wheel to that in which the last of the tongues of the lever was engaged presses against a curved projection on the lever, throws it out of gear, and the teeth fall of their own weight. The invention also consists of an improved shoe for horse-rakes and other two-wheeled carriages, for taking the weight off the horse's back when going down hill, so constructed that it shall follow the periphery of the wheel instead of resting upon the ground. This shoe is attached to a light frame, which supports the foremost part, and from which the line of draught is taken.

TOWNSEND, M. *Improvements in the manufacture of knitted fabrics.* Dated May 15, 1856. (No. 1157.)

This invention cannot be described without engravings.

THISTLETHWAITE, W. *Certain improvements in photography.* (A communication.) Dated May 16, 1856. (No. 1159.)

This invention consists in a method designed to produce and fix photographic collodion pictures upon all kinds of fabrics and materials.

MARTIN, J. *Improvements in machinery for draining or partially draining certain descriptions of wheat and other grain.* Dated May 16, 1856. (No. 1160.)

A continuous stream of wet grain is caused to pass over a revolving perforated disc or concave shell, through which the moisture passes, and over which the grain (which is supplied near the centre) is carried by its centrifugal action.

HENDERSON, W. *Improvements in the manufacture of brooms.* Dated May 16, 1856. (No. 1162.)

This invention consists in clamping the material of which a broom consists between plates or frames of metal drawn towards each other, and retained by screws passing through them, the clamping surfaces having teeth or projections on the inner surfaces.

COLEMAN, R. *Improvements in implements for ploughing, hoeing, and scarifying land.* Dated May 17, 1856. (No. 1166.)

The frame or bar of the ploughing, hoeing, or scarifying instruments is supported by two bars jointed thereto, which bars are jointed to and supported from the frame or carriage of the implement. The frame supporting the instrument is held by these jointed bars parallel to the land, and also to the carriage, when raised out or when inserted into the ground. The upper ends of the supporting bars project above the joints whereby they are connected to the carriage, and are connected by rods to lever arms projecting from a suitable barrel, to which rotary motion is given by hand, whereby the levers and rods may be forcibly acted on to elevate or depress the instruments. A further improvement in horse hoes, or hoes acted on by power, consists in mounting the hoeing instruments in a frame fitted to the carriage in such manner that it has a traversing motion from side to side, independent of the travelling carriage, in which motion it is controlled by a rack and pinion, actuated by the attendant.

CURWOOD, D. *An improved apparatus for facilitating the cleaning of knives and forks.* Dated May 17, 1856. (No. 1167.)

This consists of a flat frame or case, on which the handles are received in parallel recesses, lined with buff leather, to grip them by pressure. A hinged cover having a leather gripping surface comes down upon the handles, and presses them by a thumb-screw, thus protecting the handles from being soiled. The knives, when in the frame, have the flat of the blades all in the same plane; they are placed on a board or other surface, and there brushed with emery powder or other material.

NEWTON, A. V. *Improvements in machinery for forging or pointing wrought nails, spikes, and other four-sided articles.* (A communication.) Dated May 17, 1856. (No. 1169.)

This relates to the forging of four-sided articles by means of two hammers acting

simultaneously on the opposite or vertical sides thereof, and alternating in their action with the action of a roller, which presses on the upper side of the article, while the under side is in contact with an anvil.

CORNIDES, L. *Improvements in ornamental window-blinds, and such like transparent decorations.* Dated May 17, 1856. (No. 1171.)

The patentee takes a printed impression made on transfer paper, and well washes the surface with purified ox-gall, and when dry coats it with a solution of gelatine, or with gelatine and sugar in water, and when the coating has come to the consistence of jelly, he takes the printed impression, and places the coated surface upon a textile or wire-woven fabric stretched in a frame for that purpose. When the surface of the paper impression is dry, he damps it with a solution of acetate of alumina, or water only, and thus detaches the paper, leaving the impression transferred to the fabric. Those parts of the gelatine coating which it is desired to separate from the other parts, he softens by warm water, leaving only those parts which constitute the ornament.

MEYER, J. J. *Improvements in machinery for mortising, tenoning, rounding, sweep and straight moulding, boring, grooving, and mitreing.* Dated May 17, 1856. (No. 1172.)

These improvements relate to certain combinations of parts constituting a machine in which the operations of mortising, tenoning, rounding, sweep and straight moulding, boring, grooving, and mitreing may all be performed, instead of employing separate machines for those purposes, as heretofore. And an important feature consists in an improved mode of forming the following cutting tools:—the mortising chisel, the tenon cutters, the cross revolving moulding cutter, the mitre wheel or cutter, and the grooving cutter.

KNIGHT, R. *Improvements in apparatus for aerating liquids.* Dated May 17, 1856. (No. 1175.)

This consists in casting the separate parts of the vessels employed, of tin, and combining such parts by soldering; also in applying a valve to the syphon or pipe.

MCCLOY, R., and J. HARE. *Improvements in spinning and twisting fibrous materials, and in the machinery or apparatus employed therein.* Dated May 17, 1856. (No. 1176.)

This invention consists in an arrangement of flyers, &c., which is applicable to most of the routine processes of manufacturing or preparing threads or yarns from fibrous materials, but is especially serviceable in its adaptation to the "throstle" as employed, for example, in the spinning of cotton.

CARTER, G. *Improvements in the mode of propelling and steering vessels, and in the apparatus and machinery applicable thereto.* Dated May 17, 1856. (No. 1178.)

This consists in propelling and steering vessels by forcing air or water, or air mixed with water, through outlets, in such a position and of such a form as to expose an extended surface at the place where the air impinges against the water.

WILKES, J. T., and G. *A new or improved manufacture of rollers or cylinders for printing fabrics.* Dated May 19, 1856. (No. 1179.)

This consists in manufacturing rollers or cylinders by removing the pattern from, and expanding an old roller made according to the ordinary method of manufacture, the said expanded roller or tube being afterwards drawn upon and permanently fixed to a hollow cylinder of wrought or malleable iron or steel.

BROWN, J. *New or improved machinery to be used in the manufacture of iron.* Dated May 18, 1856. (No. 1180.)

This consists of machinery for rolling, squeezing, or compressing iron, after having been puddled, and before being rolled. It cannot be described without illustrations.

CLARK, G. *Improvements in the manufacture of illuminating gas.* Dated May 19, 1856. (No. 1182.)

The object here is to provide means for enabling servants and ships' crews, to manufacture gas in an economical and efficient manner. The patentee provides a gas-yielding oil which does not contain oxygen and sulphur. The oil he prepares by distilling boghead coal, or other bituminous substance, in a retort, heated to a dull red heat, and as the vapour comes over he condenses it in any well-known manner. This oil he applies in its crude state to the production of illuminating gas by causing it to flow in a small stream on to lumps of fire-brick, coke, or other porous matter, placed in a suitable retort set in a furnace.

WILKES, J., T. and G. *A new or improved manufacture of rollers or cylinders for printing fabrics.* Dated May 19, 1856. (No. 1185.)

This consists in manufacturing such rollers or cylinders by drawing a cylinder or tube of copper (or other metal or alloy) upon a tube of wrought iron, malleable iron, or steel.

MAUGHAM, W. *An improvement in rendering wood fire-proof.* Dated May 20, 1856. (No. 1187.)

This consists in steeping wood in a solution containing phosphate of ammonia, or of producing phosphate of ammonia within the wood, and of subjecting the solution and the wood to heat.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

RAYWOOD, R. *Improvements in railways.* Dated May 13, 1856. (No. 1127.)

This invention consists in forming rails of two parts, each bearing a T-shaped head or edge formed upon it; the two form a continuous rail like those now in use.

NEWTON, W. E. *The novel application of certain substances to be employed in printing upon woven or other fabrics and paper.* (A communication.) Dated May 13, 1856. (No. 1130.)

The inventor proposes to employ a thickening material, composed of the gummy mucilage obtained from the decoction or preparation of plants of the family of mosses and lichens.

RIDDELL, J. H. *Improvements in stoves or fire-places.* Dated May 14, 1856. (No. 1134.)

The inventor describes a stove intended: 1. To reduce the labour and economise the materials required for kindling a fire in an open grate, stove, or fire-place. 2. To prevent the smoke from the burning fuel entering the apartment. 3. To provide the means of enclosing the fire in such a way as to reduce the danger of setting fire to the apartment by sparks, &c. 4. To reduce the quantity of fuel required for heating apartments by open fire-places.

POLLOCK, W. *Improvements in the treatment or manufacture of ornamental fabrics of the lappet class.* Dated May 14, 1856. (No. 1135.)

This invention relates to that part of the manufacture of fabrics of the lappet class, wherein the loose surface threads by which the device is formed are cut from the piece to bring it to its finished state. The invention is preferably carried out in the loom in which the goods are woven. The cutting knife is a straight blade, stretching across the loom in suitable guides, and made to traverse continuously with a diagonal cutting action across the entire width of the piece. The loose threads are elevated and properly disposed to meet the cutting action of the knife, by the agency of a frame carrying a series of diagonally disposed lifting fingers. As the piece passes over or through the cutting apparatus these enter diagonally between the loose threads and the body of the piece, so as to insure the proper disposition of the threads to meet the cut.

TOLHAUSEN, A. *An improved distance indicator for public carriages.* (A communication.) Dated May 14, 1856. (No. 1137.)

This apparatus is to indicate—1. The fares due by passengers according to the distance travelled over. 2. The number of miles travelled over, or fares taken, by such carriages during the day. It is worked by an eccentric grooved ring, fixed on the nave of the hind wheel, and into which the friction roller of a joint enters, the revolutions of the wheel imparting thereby to the said joint a reciprocating motion, which is translated to the apparatus by knees, joints, and guide rods. The apparatus presents two dials, one inside, and repeated outside.

OLIVIER, C. H. *Improvements in the mode of preparing and applying silk waste.* (A communication.) Dated May 14, 1856. (No. 1141.)

The ends and hard waste silk must be sorted, dyed, dried, cleaned, separately cut into lengths of about half-an-inch, transferred to the crusher, and carded, either in a machine with thick-toothed cards, or in two machines, one with stiff-toothed cards, and afterwards in another with No. 28 and No. 26 cards. The ordinary movement of the carding machines must be altered, viz., the entry rollers must be made to work two rotations slower than for wool carding. The workers must work as slowly as possible; the flyer rather quicker than for wool; the combs a third slower than for wool; the other parts of the machine must work at the usual speed.

WALKER, R., and A. MCKENZIE. *Improvements in electric telegraphs.* Dated May 15, 1856. (No. 1147.)

This invention relates to telegraphs in which instruments are used which receive and record the messages as a series of dots or lines, and consists in the use of two or more line wires in continuation with a series of finger keys, each of which finger keys is capable of making and breaking the circuits in the two or more line wires in a suitable manner for producing the marks which indicate a letter, figure, or word. The finger keys are arranged similar to those described in the specification of a patent of the inventors', dated June 20th, 1855. This invention also consists in the use, in connection with the finger keys, of weights or springs of various degrees of strength, which, being lifted or moved by the keys, will actuate the instruments with various degrees of speed, thus producing signals of greater or less length.

BROOMAN, R. A. *An improvement in stuffing seats, cushions, furniture, and other similar articles.* (A communication.) Dated May 15, 1856. (No. 1154.)

This consists in the employment of the vegetable "istle" for stuffing seats, &c., as a substitute for horsehair.

SMITH, W. *A new application of the syphon as an irrigator, and a motive-power machine.* (A communication.) Dated May 15, 1856. (No. 1158.)

This consists in the arrangement of an apparatus fitted to the upper part of a

syphon, which is provided with receptacles which permit the withdrawal of a certain quantity of water from it without disturbing it or its action, and employing this water at the same time as a motive power, by means of the apparatus itself, and also by its fall working an hydraulic power or feeding a system of irrigation.

HARKER, W. *Improvements in giving motion to rotating shuttle-boxes of power looms.* Dated May 16, 1856. (No. 1161.)

This consists in arranging the Jacquard apparatus in such manner that the cards used for governing and acting to produce the pattern by the warps, shall act on apparatus interposed between the two levers which give motion to the rotating shuttle-box and the Jacquard apparatus, by which means the one or other lever so used to rotate the shuttle-box will be brought into action, according to the manner in which the perforated cards act on the interposed apparatus.

EABORN, C., and M. ROBINSON. *Improvements in machinery for grinding or reducing sugar.* Dated May 16, 1856. (No. 1163).

The inventors mount vertically in a frame an iron roller, cut on its periphery somewhat after the manner in which millstones are faced, and employ in conjunction therewith a certain counter-plate, an auxiliary roller, and a hopper.

BARCLAY, A., and J. WALLACE. *Improvements in apparatus for the manufacture and measurement of illuminating gas.* Dated May 16, 1856. (No. 1164.)

One contrivance has for its object the securing of a constant level of the water in the meter, and consists of a "fountain" or chamber communicating with the meter case at the height at which the water level is to be, and certain other apparatus.

MELLOR, J. *Certain improvements in grates or grids, applicable to sewers, drains, and other similar purposes.* Dated May 16, 1856. (No. 1165.)

This invention consists in the application of a series of grids, grates, or separators arranged in plates or layers, one below another, the openings gradually becoming finer as they approach the bottom. Underneath this arrangement of grids is a series of broad bars, having small spaces between them; these are also placed in layers so arranged that the broad opposing surface of the bars lie over the narrow spaces of the layer underneath, thus preventing the ascent of effluvia. Beneath these layers of bars is a filtering bed or beds. The entire arrangement is enclosed in an inner and outer casing. The inventor also provides in street grids a small upright grid, at right angles above the larger grid, and against the kerbstone of the pavement.

KREEFT, S. C. *Improvements in the manufacture of iron and steel.* (A communication.) Dated May 17, 1856. (No. 1168.)

This has for its object to produce steel and wrought iron direct from cast iron, without remelting and puddling. The cast iron having been obtained in the form desired, either by running direct from the blast furnace, or by melting the crude pig iron, the cast iron bars or plates are placed in a furnace similar to that used in the cementation of steel, and there is added some chemical re-agent or material containing oxygen, which may be readily given off by heating the material. The whole is then heated to redness, and the cast iron will be gradually decarbonized. In place of employing oxygenating materials, as above, materials not liable to be decomposed by heat may be employed, such as crushed quartz or broken fire-brick, air being allowed access in this case.

SCHEURMANN, G. *Improvements in printing music.* Dated May 17, 1856. (No. 1170.)

These consist—1. In the use of "solid and mathematical characters, which characters contain all declivities in a solid form necessary for printing music to any required length and angle," and are cast partly in common moulds and partly in moulds especially constructed. 2. In a press so constructed that, by mechanical agency, the paper is brought in contact first with the rules (to produce the impressions of the lines), and then with the characters, or first with the characters and then with the rules, or a stereotyped cast of the characters and lines may be taken, so as to print the whole at one operation.

HYNAM, J. *An improvement in the manufacture of instantaneous lights when of paper or cotton.* Dated May 17, 1856. (No. 1173.)

This consists in applying amorphous phosphorus, in combination with paper saturated with nitrate of potash, and also in combination with cotton saturated or coated with wax and stearine, in place of the ordinary phosphorus now employed for like purposes.

TITTERTON, C. *Improvements in the manufacture of zinc and zinc white.* Dated May 17, 1856. (No. 1174.)

This invention consists—1. In employing the refuse skimmings and dross obtained from manufactures where zinc is employed; in using such matters they are introduced into a muffle or retort, mixed with broken coke or carbon. 2. When using ores of zinc in the manufacture of zinc-white, in order to obtain cadmium for the most part separate from the zinc-white, the apparatus is arranged with two chambers, one to receive the first products, which contain the cadmium, and the other the zinc-white. 3.

In constructing the screen in the chambers it is important that the surfaces should be kept free of oxides, the screens are therefore suspended, so that they may be shaken. 4. In subjecting white zinc to hydraulic pressure, to obtain "body" when using it as paint.

PROVISIONAL PROTECTIONS.

Dated September 11, 1856.

2128. John Talbot Pitman, of Gracechurch-street. Improvements in the construction of iron bridges. A communication.

Dated December 9, 1856.

2918. Anne Marie Macé, widow of Georges Fremont, proprietress, of Rue des Collonnes, Paris. A new manure for preventing the vine and other diseases arising from the soil, and for other similar purposes.

Dated December 24, 1856.

3057. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in treating pile and cut pile fabrics, and in the manufacture of certain new pile fabrics. A communication from C. A. Callou.

3059. Cromwell Fleetwood Varley, of Gloucester-terrace, St. Paul's-road, Islington, telegraphic engineer. Improvements in electric telegraphs.

Dated December 30, 1856.

3091. William Armand Gilbee, of South-street, Finsbury, London. Improvements in treating beet-root for the manufacture of vinegar. A communication.

3093. William Edward Newton, of Chancery-lane, civil engineer. Improved means of preventing the explosion of steam boilers. A communication from M. E. Scrive, of Lille, France.

3095. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in lifting jacks. A communication from Mr. Michel.

3097. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in manufacturing articles of earthenware and other ceramic materials, and in the machinery and apparatus employed therein. A communication from Madame Senèque.

3099. Joseph Lane, of Manchester, merchant. Certain improvements in Jacquard looms. A communication from C. E. di San Second, of Turin.

Dated December 31, 1856.

3101. Peter Madden, of Half Moon-street, Piccadilly, architect. Improvements in furnaces or fire-places applicable to such in use for either heating of drying-kilns, roasting of substances, or heating of boilers.

3103. Charles Wye Williams, of Liverpool, gentleman. Improvements in apparatus for mechanically charging furnaces with fuel.

3105. William McCulloch, of Kilmarnock, Ayr, N. B., plumber, and Thomas Kennedy, of the same place, water meter maker. Improvements in stop-cocks or valves.

Dated January 1, 1857.

1. John Talbot Pitman, of Gracechurch-street. A machine for making carpet lining and other similar articles. A communication.

2. Charles Christian Reinhardt, of Baltimore, U. S. A. An improvement in the manner of fastening metallic backs to truss pads of glass, porcelain, or other analogous substances.

3. William Rigby, of Salford, near Manchester, engraver. Improvements in machinery or apparatus for engraving metallic cylinders or rollers employed for printing calico and other substances.

4. John Bourne, of Billiter-street, London, civil engineer. An improved steam train for navigating shallow rivers.

5. Eugène Theodore Noualhier and Jean Baptiste Prévost, both of Paris. Improvements in applying metals over hard vitrified or any other surfaces by galvanoplastic process.

6. Joseph Smith, of Great Bridgewater-street, Manchester, mechanic, and Horatio Wiseman, of Great Ancoats-street, Manchester, cabinet maker and joiner. Improvements in shutters for shop fronts, and in apparatus connected therewith.

7. Frederick Herbert Maberly, of Stowmarket, Suffolk, Master of Arts. Improvements in the construction of wheeled carriages.

8. Frederick Ayckbourn, of Lyon's-inn, Strand, gentleman. Improvements in stockings for personal wear.

9. Frederic Sarley Stott, of Bradford, York, engineer. Improvements in slide valves applicable to steam and other motive power engines.

10. Anthony Lorimier, of Bedford-square, East Commercial-road. An improvement in preparing the surfaces of printers' inking rollers and other articles when vulcanized India rubber is used.

11. William Henry Phillips, of Essex-street, Strand. Improvements on stereoscopes.

12. John Fowler, jun., of Havering, near Romford, Essex. Improvements in giving motion to ploughs and other agricultural implements.

13. William Lawrance, of Chelsea, gentleman. An improved chimney cap or cowl and ventilator.

14. Edouard Vincent Jules Laurent Georges, of Paris, gentleman. Improvements in preserving animal substances for food.

15. Joseph House, of the Minories, merchant. Improvements in concentrating and preserving milk and other liquid articles of food.

Dated January 2, 1857.

16. John McLennan, of Park-place, Highbury, Islington, John Palmer, and John Henry Palmer, of Mildway-street, Stoke Newington. An economical gas light generator and consumer.

18. John Pettigrew, of Glasgow, N. B., baker. Improvements in the manufacture of bread.

19. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in apparatus for roasting meat. A communication from P. de Musigny, of Dijon, France.

20. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in pressure gauges. A communication.

21. Augustin Gras, of Marseilles, mechanic. Improvements in obtaining motive power.

22. John Baird, of Govan, near Glasgow. Improvements in planting potatoes.

23. Nicolaus Charles Szerelmey, of Bermuda-place, Bath-road, Queen's-road, Peckham, esquire. Improvements in preparing combinations of materials for rendering walls and other structures waterproof.

24. Joseph Turner, of King's Lynn, Norfolk, engineer. Improvements in oscillating cylinder steam engines.

25. James Harris, of Hanwell, Middlesex, engineer. Improvements in obtaining and transmitting motive power.

26. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Certain improvements in rotary steam engines. A communication.

27. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improved steam engine. A communication.

Dated January 3, 1857.

28. Leonard William Watkins, of Charlotte-ter-

race, New-cut, Lambeth. The manufacture of a composition, commonly known as putty, to be used in glazing and other purposes.

29. Francesco Ferro, of Genoa, Sardinia, and Hatton-garden, London. The manufacture of paper from a vegetable or herb that grows in the isle of Sardinia and Spain, and which he proposes to call Ferus paper.

30. William Edward Newton, of Chancery-lane, civil engineer. Certain improvements in the means of connecting, accumulating, retaining, and applying reserved power for the application of railway brakes in sudden emergencies. A communication.

31. Alexander Angus Croll, of Harold's-wood-lodge, near Romford, Essex, civil engineer. Improvements in the manufacture of coal gas.

32. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in winding, twisting, and doubling fibrous materials, in the machinery employed therein, and in the mode of driving the same, parts of which improvements are applicable to the communicating of rotary motion to other machinery. A communication from J. B. Heiller, of Mulhouse.

33. Christopher Binks, of London. Improvements in treating ore in the manufacture of iron, and in obtaining products therefrom.

34. Christopher Binks, of London. Improvements in obtaining certain compounds of cyanogen.

Dated January 5, 1857.

35. Thomas Forsyth, of Manchester, engineer. Improvements in locomotive and other steam engines.

36. John Ingham, of Bradford, and Edward Ingham, of the same place, and Benjamin Ingham, of Halifax, dyers and finishers. Improvements in apparatus employed in finishing textile fabrics.

37. Andrew Brundish, of Birmingham, manufacturer. Improvements in mounting knobs, and in constructing and mounting roses for locks, latches, and other such like fastenings.

39. Frederick Braithwaite, of Gower-street, Bedford-square, civil engineer. An improved mode of extracting the iron from tin ores.

40. David Baker, of the Gisbro' Alum Works, Yorkshire. An improvement in the manufacture of paper.

41. William Gossage, of Widnes, Lancaster. Improvements in the manufacture of sulphuric acid, and in the construction of apparatus used for such manufacture.

42. John Oldham, of Preston, telegraph clerk. An apparatus for closing the supply cocks of gas burners.

43. John Moore Hyde, of Cumberland Iron Works, Bristol, iron ship builder. Improvements in iron and wooden ships or vessels and in the adaptation of the machinery for propelling the same.

Dated January 6, 1857.

44. François Frédéric Dumarchey, Samuel Levy, and Joseph Mayer, all of Paris. Improvements in wheels and axles for common road carriages.

45. Thomas William Kennard, of Sussex-gardens, Hyde-park, civil engineer. Improvements in metallic piles.

46. Thomas Holmes, of Pendleton, Lancaster, bleacher. Improvements in the prevention or consumption of smoke in furnaces and fire places.

47. Louis Antoine Ritterbandt, of Warwick-street, Regent-street, doctor of medicine. Improvements in the treatment of substances containing earthy phosphates.

48. Julius Decimus Tripe, of King's-place, Commercial-road, gentleman. Improvements in mechanism for affording increased security to valves, taps, or other apparatus used for regulating or interrupting the flow of gases, vapours, and liquids.

49. Frederick Herbert Maberly, of Stowmarket, Suffolk, master of arts. Improvements in constructing receptacles for sewerage, for separating the fluid from the solid portion thereof, and for purifying, storing, and carrying away the same.

50. Henry Bougleux, of Leghorn. Improvements in steam boilers.

52. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in knitting frames. A communication from Mr. Puech.

53. Alexander Arthur Dunbar, of Glasgow, N. B., joiner. Improvements in lifting, lowering, and disengaging ships' boats.

54. Matthew Trattles, of Staithes, York, tool maker. Improvements in tools for cutting cylindrical and conical forms.

55. Charles Cook, of Mount-street, Grosvenor-square, builder. Improvements in apparatus for generating draughts in chimnies and for other purposes.

Dated January 7, 1857.

56. Benjamin Hargreaves, of Habergham Eaves, near Burnley, Lancaster, cabinet maker, and Abraham Mosedale, of Burnley, moulder. Certain improvements in looms for weaving.

57. Charles Frederick Claus, of Latchford, Chester, chemist. Obtaining tin or compounds of tin from the scraps or clippings of tinned sheet iron.

58. James Morris, of New Kent-road, ladder and barrow maker. Improvements in washing machines.

59. Peter Pilkington and Thomas Entwisle, of Accrington, Lancaster. Improvements in machinery or apparatus for washing, cleaning, agitating, grinding, polishing, or mixing various materials.

60. William Joseph Curtis, of Crown-court, Old Broad-street. Improvements in railway axletree boxes.

61. William Young Smith, of Sydney-street, Sheffield. An improvement in sawing all kinds of wood.

62. Henry Charles Hill, of Croydon, Surrey. Improvements in screw and lifting jacks, and in machines for lifting, pressing and lowering.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

106. Walter Thurtell, the younger, of Wells, Norfolk, merchant. Manufacturing cases of deposit for adhesive stamps, labels, or papers, so arranged that such adhesive papers are moistened and kept in a moistened state distinct and separate. Dated January 13, 1857.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January 20th, 1857.*)

2111. J. Neuenschwander. Certain improved processes of preparing milk to be preserved.

2123. J. Hudson. Improvements in whetting or setting "printers' doctors" and others straight-edged tools or instruments.

2128. J. T. Pitman. Improvements in the construction of iron bridges. A communication.

2130. A. D. Bishop. Improvements in derricks for raising sunken ships and other heavy bodies from below water, and moving heavy bodies from one place to another.

2143. W. Whittle. New or improved machinery for the manufacture of nails.

2149. C. Hill. Improvements in the manufacture of lubricating matters.
2154. J. B. J. Lassie. A new system of aerial navigation.
2160. R. E. Garrood. Improvements in stop cocks and valves for the drawing off and passage of air, gas, steam, water, and other fluids, or for any other purpose for which the same may be applicable.
2171. J. G. Martien. Improvements in the manufacture of iron.
2172. R. Burns. Improvements in bone mills.
2174. D. Crichton. Improvements in looms for weaving.
2177. W. F. Spittle. A new or improved spindle for braiding and plaiting machines.
2200. A. Templeton. Improvements in the manufacture of pile fabrics.
2203. E. Finch. Improvements in the construction of wrought-iron masts, bowsprits, yards, booms, gaffs, and spars, and in rigging ships.
2225. J. G. Taylor. Improvements in fastenings, connectors, and couplings, and in the application thereof.
2233. S. Calley. Improved composition and compositions for coating or covering surfaces, particularly the bottoms of ships and vessels.
2256. M. Pellen. Rendering impermeable by gas, caoutchouc, gold-beaters' skin, paper, gauze, and similar materials used for things adapted to receive an ascending force, such as balloons, aerostatic machines, toys, &c., &c., by the application of a peculiar varnish.
2343. J. Hinks. A new or improved manufacture of metal boxes.
2350. W. Ward. An improved manufacture of woven fabric.
2415. A. Tooth. An improved process for bleaching malt, whereby the colour is rendered more suitable for the brewing of pale or bright malt liquors.
2422. J. Green. An improved cooking apparatus.
2555. L. Urion. Improvements in match-boxes or holders.
2594. L. Urion. Improvements in machinery for the manufacture of matches and match boxes.
2626. J. Dickinson. Improvements in machinery or apparatus used in the preparation of cotton or other fibrous substances for spinning.
2689. J. Aitken. Improvements in the furnaces employed in the manufacture of iron or other metals.
2866. T. Crabtree. Improvements in card-setting machines, and in certain machinery or apparatus employed in the construction thereof, which apparatus is also applicable to similar purposes.
2999. G. M. Clarke. Improvements in the manufacture of moulded candles.
3030. T. W. Lord. An improved mode of drying flax, tow, hemp, silk, cotton, and other yarn, in the process of dressing, warping, sizeing, beaming, and preparing yarn for weaving.
3097. R. A. Brooman. Improvements in manufacturing articles of earthenware and other ceramic materials, and in the machinery and apparatus employed therein. A communication.
3102. W. Bray. Improvements in traction engines.
3103. C. W. Williams. Improvements in apparatus for mechanically charging furnaces with fuel.
18. J. Pettigrew. Improvements in the manufacture of bread.
22. J. Baird. Improvements in planting potatoes.
23. N. C. Szerelmey. Improvements in preparing combinations of materials for rendering walls and other structures waterproof.
31. A. A. Croll. Improvements in the manufacture of coal gas.
46. T. Holmes. Improvements in the prevention or consumption of smoke in furnaces and fireplaces.
47. L. A. Ritterbandt. Improvements in the treatment of substances containing earthy phosphates.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1854.

98. James Newall.
111. Henry Corlett.
113. Bevan George Sloper.
115. Edward Lord.
121. Edmund Sharpe.
126. George Henry Bursill.
129. John Norton.
135. Charles William Rowley Rickard.
180. William Massey.

LIST OF SEALED PATENTS.

Sealed January 14, 1857.

1654. Charles Burrell.
1660. William Clibran and Joseph Clibran.
1661. William Watt.
1673. Richard Morgan.
1674. Thomas Duncan.
1690. William Leuchars.
1692. George Frederick Hipkins and John Britten.
1720. Robert Richardson and Jonathan Edwin Billups.
1732. Charles Cowper.
1746. Giles Mabie.
1761. Joshua Mather and William Forshaw.
1762. Richard Archibald Brooman.
1779. Richard Clarke Pauling.
1782. George Colleton Cooke.
1800. Henri Evette.
1811. Richard Archibald Brooman.
1812. Richard Archibald Brooman.
1942. Anthony Charles Vetter de Doggenfeld.
2545. Peter Fairbairn and Robert Newton.
2567. John Young.

Sealed January 16, 1857.

1675. David Bowlas.
1706. John Whitehouse, jun.
1708. William Astbury Jump.
1709. John Smith and Enoch Harrison.
1715. Elias Leak.
1718. John Pursloe Fisher.
1724. William Green.
1734. Henry Hindle.
1749. John Derbyshire.
1804. Joseph Hopwood.
1805. George Holcroft and Peter Johnson.
1813. Pierre Marie Joseph Chamblant.
1822. John Avery.
1824. Richard Albert Tilghman.

1825. Robert Reeves.
1828. Richard Archibald Brooman.
1829. Thomas Donkin.
1830. Josiah Rhodes.
1840. Henry Walker Wood.
1944. John Henry Johnson.
1967. John Henry Johnson.
2015. John Henry Johnson.
2501. Robert Struthers.
2539. Thomas Clutton Salt.
2703. Robert Mushet.
2748. Thomas Francis Joyce.
2773. Edward Tucker.

Sealed January 20, 1857.

1716. Marc Antoine Augustin Gaudin and Eugène Xavier Choumara.
1717. Francis Barbour.
1719. James Clark.
1722. Frederick Simpson.
1728. Maurice Vergnes.
1737. James Clark.
1739. George North.
1759. George Alexander Copeland.
1760. Charles Tiot Judkins.
1780. James Dickinson.
1835. Charles Théodule Launay and Jules Chopin.
2399. John Stephen.
2404. Thomas Stokes Cressey.
2439. Frederick Arthur Magnay and Ralph Radcliffe Whitehead.
2589. Samuel Cotton.
2722. Frederick Arthur Magnay.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine*, must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1747.] SATURDAY, JANUARY 31, 1857. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

CLIFFORD'S METHOD OF LOWERING BOATS.

Fig. 1.

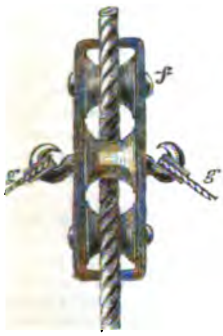


Fig. 3.

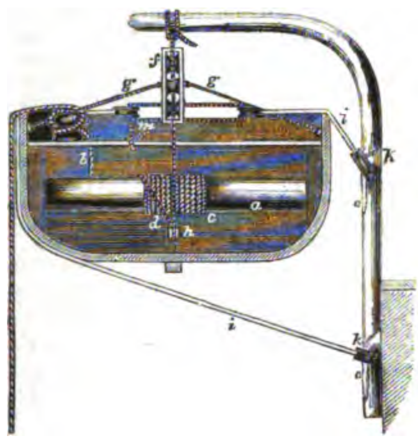
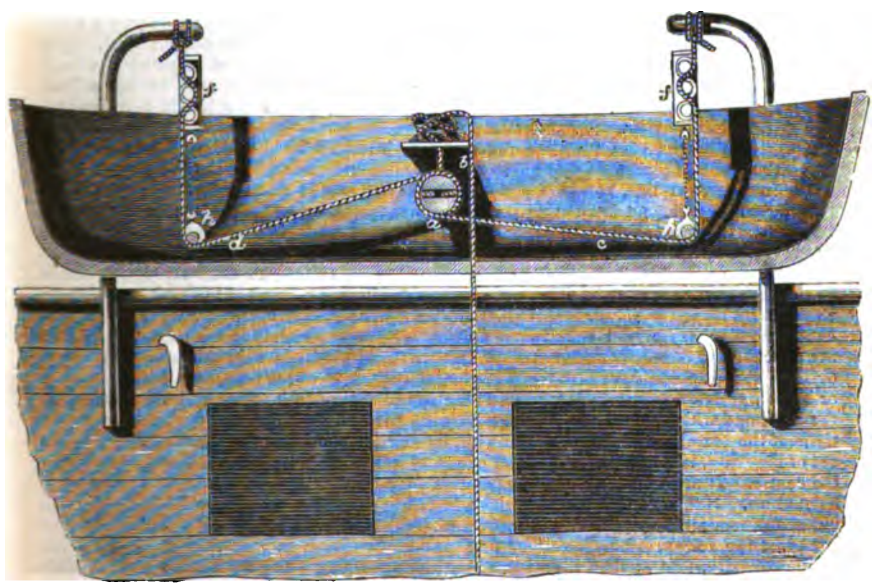


Fig. 2.

Fig. 4.



CLIFFORD'S METHOD OF LOWERING BOATS.

The mechanical difficulties that have hitherto attended the safe lowering of ships' boats, have at last received a practical solution, chiefly by the novel application of a principle well known to all sailors—the "turn and a half" on a running rope; and it is a cause for surprise that a means so natural to all naval men, and so intimately familiar with every nautical operation, should not long since have been brought to bear. The simplicity of this plan is its great merit, and this simplicity we know has only been the result of long and continued labour and experiment extended over the last five years. The well-known arrangement just alluded to for regulating strain, is obtained by coiling a rope round a fixed object, and then holding on—the friction caused by the tension of the rope creating a power of control termed a "dead nip," as at a steam-boat pier, the spring boy, by taking a few turns of the rope round the timber head, makes his own weight at one end of it an equipoise to the pull of the steamer upon it. A block effecting the same object, but with the rope passing over moveable sheaves instead of fixed surfaces, and thus making a "turn and a half on a live nip" (figs. 1 and 2), without wearing the rope, is the leading novelty of the present invention. The great stumbling blocks to success hitherto in lowering boats have been, the want of control when lowering a heavily-laden boat with the direct purchase of a single rope, and the fact that the various processes of unlashing, lowering, and disengaging have been the divided duties of men separated, some in the boat and some in the ship, any error through inadvertency or accident on the part of either producing failure, and too often fatal consequences. Here they are all done from the boat by one only of the boat's crew, whose simple weight, irrespective of any additional assistance whatever, is made to hold in equilibrium the weight or descending momentum of the boat with its entire crew, which he has thus the power to check or control at will. Each separate operation is the natural consequence of one act (slacking off a rope), and they are all necessary sequents one of the other.

The means of reducing the weight of the boat to that of the man lowering is also made the means for preventing the boat canting in its descent, and the passage of the ropes by which the boat descends, through the block of an entirely novel character and action, accomplishes this end.

Mr. Clifford hoists boats up with the usual tackles or pendants to the davits, his apparatus being solely employed to unlash, lower, and disengage them.

The instruments he uses are the ordinary ships' gripes, or pieces of rope of equal length, which are divided into two parts, *i i*, fig. 3, in both ends of each of which, thimbles, *k k*, are placed, and the two pieces are held together by a lanyard. These two pieces being passed round the boat, one above and the other below, and the thimbles, *k k*, passed up the prongs on the davit, *o o*, are hauled tightly together at *m* by the lanyard, which is then fastened to the boat's thwart. The gripe now clasps the boat all round, holding it firmly to the ship's side by means of the thimbles, *k k*, at the points, *o o*, and it will at once be evident that, should there not be time to release the lanyard at *m* when the boat is wanted in a hurry, when it is lowered, the thimbles will slip down the prongs, and the boat at once be free without the gripes being touched. One end of the lanyard being fast to the boat's seat, prevents the gripes being adrift when on the water.

Next, two blocks of a peculiar construction, invented by himself: these blocks have three sheaves, not placed side by side as in an ordinary three-fold block, but one below the other in a straight line, and in the same plane: *vide* figs. 1 and 2: a cylinder or barrel, turning on an axis, and fixed athwart the boat amidships, and at right angles to her sides, immediately below the central thwart, as at fig. 3, *a*: two leading single blocks secured to eye-bolts in the keel, at the same distance apart as the davits are to which the boat is hoisted up, as at figs. 3 and 4, *h h*: a pendant or rope spliced to each davit end (similar to the usual man-ropes or life-lines, of which men retain a hold when lowered in quarter or stern boats.) These ropes, for distinction, we will call lowering pendants; figs. 3 and 4, *c d*. The blocks, *f*, figs. 1 and 2, have an eye-bolt on each cheek, to which short pendants are spliced, and the other ends of which, fastened to eye-bolts in the boat's side, form slings or lifts, *g*, figs. 3 and 4, and prevent any possibility of the boat's canting. The cylinder or barrel, *a*, figs. 3 and 4, is furnished with a rope, secured to it at one end near the side of the boat, and which we shall call a winding-rope, its action being to regulate the revolutions of the barrel, and to wind and unwind the lowering pendants on it. This rope, by the act of lowering, is wound on to one end of the barrel as the lowering pendants run off from the centre. It must be somewhat longer than the height of the boat from the water when hoisted up. Hauling on it reeves the two lowering pendants equally, and slacking it off, unreeves them alike by allowing the barrel to turn, insuring not only a descent on an even keel, but the release of each end of the boat at the same moment. The block, *f*, has this peculiarity, that when a rope is rove between the upper and middle, and the middle and lower sheaves, it will pass freely between them, and round the centre sheave when slack, but will nip all the sheaves when tightened (without chafing the rope), thereby ena-

bling a person having control of the rope to have perfect command over any weight either attached to the rope if the block be fixed, or attached to the block if the rope be fixed, and the block allowed to traverse on it, which latter is the case in the operation of lowering a boat on Mr. Clifford's plan. The resistance of this block to the free passage of the rope through it is regulated by the relative positions of the sheaves to each other and the space between them, greater space giving freer action to the passage of the rope, but less power, consequently. Now, while it is required in lowering ships' boats to obtain such power as will enable one man lowering by the winding rope to have perfect control over the descending weight of the boat, it is of equal importance that all resistance to the free run of the lowering pendants should cease with the necessity for it; and both these important ends are insured by the block, on the proportions of those given in figs. 1 and 2.

The mode of proceeding is as follows:—When the boat is hoisted up, reeve the lowering pendants, *c* and *d*, through the blocks, *f*, as shown in figs. 3 and 4, then through the leading blocks, *h*, and lastly, having, by revolving the barrel, *a*, wound up on it the winding-line, *b*, figs. 3 and 4, point the extreme ends of the lowering pendants through a hole or holes made for the purpose through the centre of the barrel. By hauling on the winding-rope, *b*, the barrel then revolves and winds equally on it the lowering pendants, in the same manner as in winding up a common humming-top. The end of the winding-rope is then led through a hole in the thwart, immediately above it, where it is made fast to a cleat. The ordinary tackles, by which the boat has been hoisted up, being next slacked up and unhooked from her, she remains suspended by the lowering pendants, and is at the sole command of any person attending the winding-rope. By slacking up that rope, the barrel revolves and unwinds the lowering pendants. As the latter are thus slacked up, the strain is (proportionately) taken off the sheaves of the blocks, and the blocks are drawn down the lowering pendants by the weight of the boat to which they are fastened, at a speed regulated by the man attending the winding-rope, and at whatever point of contact the boat touches the water; letting go the winding-rope releases it, as the ends of the pendants not being fastened to the barrel, but merely put into a hole in it, unreeve themselves. Thus is secured, by one act, the unlashing, the lowering the boat steadily, in an upright position, at any speed desirable, and her detachment from both lowering pendants at the same moment. The inventor has also adapted the arrangement to stern boats.

The favourable reports received from all the officers appointed by the Admiralty to test this plan have led to instructions being given to the inventor to teach the mode of fitting to the various artizans in the Government dockyards, and boats are now being fitted at Woolwich, Portsmouth, Sheerness, and Devonport, under the authority of competent officers of each establishment, with a view to the general adoption of the system throughout the service. Similar reports from their officers have induced its compulsory use in all emigrant ships by order of the Emigration Commissioners, and their example has been followed by some of our principal mercantile firms and large steam companies.

Public notice was first drawn to this invention, through the Institution of Civil Engineers, where it was exhibited before a meeting of naval men and engineers in 1855, on which occasion it received the strongest expression of approval from Capt. Edredge, the unfortunate commander of the missing *Pacific*. Subsequently, it was brought officially before the Surveyors of Lloyd's Registry for British and Foreign Shipping, who reported on it most favourably to the committee of that important body, since which time its practical utility has gradually led to its extended use. The course adopted by Her Majesty's Emigration Commissioners in causing trials to be made specially with this against other plans, under their chief officers at the different ports, has done far more than anything besides to fix public attention upon it. The necessity for the compulsory adoption of an improved system in all ships has been long and painfully evident, and the supineness of naval authorities, and the perfect indifference of proprietors to avail themselves of any improvements which would give at once a sense of security, and a means of escape to crews and passengers in times of urgency, has been matter of public notoriety and comment, and led to the insertion of the stringent clause 27, Passenger Act, 18 & 19 Vict., cap. 119, by which masters of passenger vessels are rendered liable to penalties of from £5 to £50, for not "carrying certain boats in such a manner as to be, in the opinion of the Emigration Officer, *most available for immediate service*." This Act has, however, remained a dead letter, but the course lately taken by the sailors in the North, at the public meetings held at Peterhead, Aberdeen, Dundee, &c., and the general public feeling in the matter, will not long allow things to remain as they are.

It is to be hoped that at last some return will be made to the inventor for the personal risk he incurs in being present and in the boats himself, as he always is, in all the dangerous and severe trials to which he has been subjected, in order that the public may see for themselves that, with proper precautions, a remedy does exist for this *national "want in the service."*

TONNAGE AND SHIPPING REGISTRATION.

Mr. Atherton evidently appreciates the advantage of having the last word. He knows that with a great many a bold assertion, if allowed to pass unchallenged, possesses all the charm of truth. He therefore, in quitting the field, discharges in his last week's letter his two parting batteries, which he imagines will leave us maimed and bleeding, and unable to pursue him in his retreat. These are—1. A repetition of the strange notion which seems somehow to have got impressed on his brain, that we have been misled by an erroneous version of his opinions attributed to him by others, but widely different from that which the words of his paper, read before the Society of Arts on January 16, 1856, naturally bear. 2. A retort upon ourselves of the charge we made on him of having modified his opinions. It appears that there is a "close analogy between his summary of the *deficiencies* of the present law, as set forth in the last clause, and the declarations of opinion at which we GRADUALLY arrived, as quoted textually in HIS letter of the 24th September."

With regard to the first of these points, *where* are we to find the "erroneous version" of his opinions to which Mr. Atherton refers? With the exception of our own review of his paper, we do not know that any one has systematically examined the several objections to the present law, and improvements upon it, suggested by Mr. Atherton himself, in the paper so often referred to. A shipowner, who took part in the discussion, expressed annoyance at an attack on the shipping interests, which he thought some of the remarks in the paper implied, and on which he certainly had a right to ask for some explanation, as they bore a very ugly resemblance to an attack. Mr. Lindsay taking this presumed attack for his text, published a very intemperate letter, on which we expressed our opinion pretty plainly in our first article. Surely, Mr. Atherton does not mean to point out these as the "erroneous versions of his opinions," by which we have been misled. He denied at the time that any insult was *meant;* and although we expressed our opinion that the words were unfortunate, we emphatically stated our conviction that no insult was intended. But this is a mere petty matter quite beside the main question; yet we are not aware of any examination of Mr. Atherton's paper beyond that very limited one which this supposed insult produced! We are driven then to the conclusion that we have misled ourselves. We are quite content to stand upon this issue. Let any one of our readers peruse the paper read before the Society of Arts last year, and our remarks upon it in April last; and let him judge between us. We have very little doubt but that he will pronounce our summary of the paper in question, quoted by "Veritas," to be strictly in accordance with the literal acceptation of Mr. Atherton's words. If Mr. Atherton adopts for the interpretation of his writings the principles laid down in the famous tract, No. 90, and expects us to understand them in a non-natural sense, we must respectfully decline making any such attempt, for how shall we know when we have the right sense?

With regard to the second point—viz., our imputed gradual change of opinions until we adopted Mr. Atherton's own—we must again call attention to the fact, that seeing that gentleman's game, and that he wished to represent us as conforming to his views, we repeatedly showed that the change (which it now seems was merely apparent) was on his part, and not on ours. We cannot but admire his modest assurance in asking us to adopt as our own "the declarations of opinion at which" we are supposed to have "gradually arrived, as quoted textually in *his* letter." We have already stated the reasons why we did not, at the time, think it worth while to reply to his letter of the 14th of September. It is very easy, by taking isolated passages apart from their context, to represent them as bearing a very different meaning from what they were intended to bear. In this way admissions of very little real moment may be made to assume a consequence which they do not possess. Our readers will scarcely have forgotten that it was by tacitly abandoning the greater part of this paper, including the onslaught on the present tonnage measurement as being the cause of shipwrecks, dear bread, and we know not what other evils, and on the very principle upon which the measurement is founded, in order, apparently, that nothing might escape the fire and sword of the impetuous assailant—thereby impugning the mode of calculation of the cubical contents of an irregular body, which the scientific world has long accepted as beyond dispute the most accurate — and by narrowing his ground to what he is pleased to call the *deficiencies* of the present law, that he succeeded in making out any apparent coincidence of opinion between us.

What, then, are the *deficiencies* of the present law on which we are agreed? Of course we acknowledge—the text of the Mercantile Shipping Act would contradict

us else—that the present law does not require the registration of the light or load displacement of a vessel—does not prescribe a limit of load water line—does not require the registration of indicated horse power, or any real measure of engine power equivalent to this. We may further acknowledge, that for scientific purposes, a knowledge of these data may be of the greatest benefit; and we may further admit, that it may be worthy of the consideration of a committee appointed by a scientific body of acknowledged authority, whether these data can be obtained by legislation or otherwise, without injury to the shipping interests. So far only have we ever expressed any opinions at all approaching to those of Mr. Atherton, and at these we certainly did not arrive gradually; but, if we mistake not, Mr. Atherton claimed our support to his agitation on the strength of "admissions" made in our first article, in April. But how wide is the difference, after all, between these admissions and the paper of January, 1856! unless, indeed, Mr. Atherton abandons all this paper but the "*last clause.*" It is one thing to acknowledge "deficiencies," and to be desirous that means should be found to supply them, so far as the interests of science are concerned—and that *not necessarily* by legislation—respecting all the while the wishes and rights and *freedom from unnecessary control* of the shipping interests, and at the same time accepting the Merchant Shipping Law of 1854, as admirable for the purposes for which it was intended, and reflecting equal credit upon the Government which enacted it, and the classes concerned in shipping which thankfully acquiesced in it, although it in many respects places them under conditions which they considered as barely just to themselves, but tending to the benefit of the community at large. It is quite another thing to clamour for the remedy of these "deficiencies" by the substitution of an entirely new "system," based on entirely different principles, and to justify this clamour by imputing to the Law of 1854, and to the system of measurement therein sanctioned, the responsibility of the loss of human life by shipwreck, dearness of provisions, and other horrors, sufficient to make the hair stand on end, condemning the law in question as a deliberate and baneful sacrifice of the interests of the public to the morbid and mercenary self-interest of the shipping classes. This is what Mr. Atherton's paper, which he still upholds as "the text of his opinion," does; and this is what no respect for Mr. Atherton's character and honesty of purpose, no seeming but hollow "analogy between his summary of the *deficiencies* of the present law," and "our declaration of opinion" will ever induce us to join him in doing.

To the Editor of the Mechanics' Magazine.

Sir,—With reference to the Rev. Dr. Woolley's letter, in your last week's number (1746), I beg to refer your readers to my letter in the *Times* of the 2nd inst., recognising the term "capacity" as being the proper denomination of our present system of shipping admeasurement, rather than "tonnage," which gave rise to the Rev. Dr. Woolley's letter in the *Times* of the 6th inst., commencing, "My friend, Mr. Atherton, and myself have at heart the same object." I feel that I have no occasion to make any further remarks. I shall be satisfied that your readers who may take an interest in this matter read these letters, *as originally published in the "Times" of the 2nd and 6th inst.*, and judge for themselves.

I am, Sir, yours, &c.,
Chas. Atherton.

Woolwich Dockyard, Jan. 26, 1857.

BOILER EXPLOSIONS, AND THE RAISING AND USE OF STEAM.

From the Report of the Committee of Management presented to the Second Annual Meeting of "the Association for the Prevention of Steam Boiler Explosions, and for Effecting Economy in the Raising and Use of Steam," held at the Town Hall, Manchester, on Tuesday, the 20th day of January, 1857, we learn that the number of firms registered as members on the 31st of Dec., 1856, is 462, with 1,301 boilers in use at their works, which shows an increase in the number of members reported at the last annual meeting of 193, with 458 boilers. The committee trust that this may be regarded as an evidence that the extra security against accidents afforded by the periodical visits of the inspectors, and the amount of practical information acquired by them, and placed at the service of the members, is now being justly appreciated. During the past year 2,246 visits have been made, and 1,456 boilers examined by the chief and sub-inspectors. These visits disclosed that 143 boilers, or nearly ten per cent. of the whole, were in a dangerous condition. No explosions have yet occurred upon the works of any of the members since the inspection began, although in Great Britain generally, not less than thirty-one boilers have exploded during the last year, causing the loss of fifty-eight lives, and serious injuries to upwards of seventy persons.

From the coroners' inquests, as to the causes of boiler explosions within the last

year, it is inferred, in the absence of all reference by the witnesses (in so far as has been observed), to surcharged steam as the source of mischief, that this probable cause of accident is little known or suspected. "The fact that steam while in contact with water may be surcharged with heat to a very high degree, without any greater effect on the pressure gauge, or safety valve, than is due to ordinary gaseous expansion, rests," says the Report, "upon the undoubted authority of scientific inquirers. Thus, there *may* accumulate within the boilers a latent force in the form of superabundant heat, which, on the disturbance of the water from any cause, *may* combine suddenly with it, producing steam of excessive pressure, resulting in an explosion." As this conclusion is not universally admitted, even by those who are acquainted with the scientific fact on which *the inference* rests, and is not even known or suspected by most practical men employed about steam boilers, it appears to be a case which calls for a practical solution from the Association, and means will probably be taken within the next year, at the expense of the entrance fee fund, to determine experimentally this important point.

The following remarks are condensed from the Report (dated Jan. 12th, 1857) made by the chief inspector, Mr. R. B. Longridge, of Manchester, to the Committee of Management:

CAUSES OF BOILER EXPLOSIONS.

1. *Over pressure.*—Boilers working at a dangerous pressure were principally old Butterley boilers, or cylindrical boilers of large diameter, with few or no stays, and not originally intended for so high a pressure. Several have been replaced, and others strengthened by additional stays, or the pressure has been reduced.

2. *Corrosion and failure of plates.*—The corrosion frequently observed in the interior of boilers is caused by the presence of acids in the water. The remedy is the regular use of lime, potash, or other alkali, to neutralise the acid. Where dampness exists in the seating of a boiler, oxidation of the iron ensues, and the plates are rapidly wasted away. Should this arise from any extraneous cause, the remedy is obvious; but where, as often happens, the dampness is produced by leakage from the seams or fractured plates, this is usually attributed to defective materials or workmanship. Although this often does contribute to such failure, it is not the primary cause. In the majority of cases, leakage and fracture of the plates at the underside of a boiler originate from imperfect circulation of the water. In multitubular boilers, where the greatest heat exists in the upper rows of tubes, the water at the bottom remains comparatively cool and undisturbed, and these boilers are especially liable to leakage. In flued boilers, with furnaces in the flues, one of the seams on the underside, about the middle of the boiler, is often found fractured between the rivet holes throughout a considerable portion of the semi-circumference. In cylindrical boilers, with external furnaces, the steam, rising from the bottom, prevents a regular descending current of water, and any mud or sediment settling on the plates and lying undisturbed, allows them to become overheated, fractured, or even burnt away. Several examples of this kind might be adduced. To remedy these evils, fix in the boiler sheets of iron to separate the ascending and descending currents, or where this cannot be arranged for want of space, convey a large pipe, communicating with the upper part of the water, underneath or within the boiler, with several branch pipes to supply water for the ascending current. The advantage derived would not be confined to the durability of the boiler, but would also contribute to an increased evaporation of water. No point connected with the construction of boilers more deserves the attention of engineers.

3. *Safety valves.*—Although not unfrequently safety valves are found inoperative, from negligence or recklessness on the part of the attendant, this is not a common cause of explosion. The danger of explosion, from the ignorance of the attendants, is considerably diminished by the almost universal use of pressure gauges; but, although these are valuable for indicating the rising or falling of the steam, they should never be considered as substitutes for safety valves. It is a very common but dangerous practice to weight safety valves to correspond with pressure gauges. As an additional precaution, every boiler, or set of boilers, should be provided with an indicator tap to test the gauges.

4. *Water gauges.*—The glass tube is the most perfect gauge for showing the height of the water, and much preferable to the float, on account of the difficulty of keeping the float-wire sufficiently free to act, without escape of steam at the packing. Where the glass gauges were found inoperative, the passages had been choked with sediment, to which they are very liable where the water is dirty, unless frequently blown through. Such obstructions only show want of attention on the part of the fireman.

5. *Injury resulting from deficiency of water.*—This is a very frequent and most serious source of danger. When flues become

overheated from deficiency of water, the temperature of the steam increases in a much higher ratio than the pressure, and the pressure gauge is no longer a true indicator of danger. Many examples prove that whenever heat is communicated to a boiler above the water level, the steam must be surcharged in a greater or less degree, without a corresponding increase of pressure. The water being allowed to fall too low, or the external flues being carried too high, produces the same effect. To provide against this danger, every boiler should be provided with efficient fusible plugs, or safety valves, connected with floats, either of which should be arranged to come into operation and allow the escape of steam, before the water could reach a dangerous level. Where, however, a boiler is already in danger from this cause, the best course to be pursued is to draw or damp the fire, and then leave the boiler to cool, carefully avoiding any measures which might cause agitation of the water, such as starting the engine or opening any of the valves.

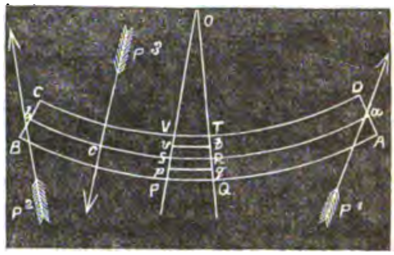
(To be continued.)

On the Physical Conditions involved in the Construction of Artillery, &c., &c. By ROBERT MALLET, Member of the Institute of Civil Engineers, A.B., T.C.D., M.R.I.A., &c. London: Longman, Brown, Green, Longmans and Roberts, 1856.

(*Concluded from p.* 79.)

OF all the practical applications of exact science, there is none on which so little reliance can be placed as that which treats of the "strength of materials." One, and that probably the most influential, cause of the wide difference between the theoretical and practical measures of the strength of any structure, arises from the difficulty of ascertaining and measuring the degree in which the effect of extension or contraction in one direction is modified by the coincident extensions or contractions in the two other directions mutually at right angles to the first. In the greater part of problems of this nature, the elastic forces arising from the extensions or contractions in one direction only are considered, while it is certain that in every case there are dilatations or contractions in at least one, and generally in two other dimensions.

Thus, in the figure; if ABCD be a vertical section of a beam originally horizontal,



and bent into the form represented by the forces P_1, P_2, and P_3, and *acb* be the section of the neutral surface; it is assumed in the usual investigations that the breadth of the beam—its dimension, that is, in the direction normal to the neutral axis, is unaltered after deflexion; and the extensions and contractions of the fibres below and above the neutral line are alone considered. Thus, if SR be a small elementary portion of the neutral axis, SO, RO the normals at S and R intercepting the lengths PQ and VT respectively of the lower and upper surfaces of the beam, it is assumed that these lines represent the expanded and contracted lines which originally were of the same length SR, and so for intermediate lines, while the breadths VP, TQ are supposed to remain unchanged.

We believe that in most cases these assumptions, and consequently the results which are made to flow from them, are very incorrect, and that the divergence of theory from practice in this most important subject is to be traced to this cause. Of late, however, experiments have been made on the mutual relation between the linear and cubical expansions; and attempts have been made to represent these relations by equations. It were much to be desired that the modifications of all the received theorems on the strength of materials which this more comprehensive view of the general problem requires, formed the subject of investigation of some of the able mathemati-

cians who have devoted their attention to this branch of mixed science—especially Professor Stokes—the resources of whose analysis are so inexhaustible.

The theory of the strength of materials plays an important part in all questions regarding the best mode of applying material to the construction of guns. Dr. Hart, Fellow of Trinity College, Dublin, has furnished Mr. Mallet with an investigation of the law which expresses the relation of the pressure to the radius of the cylindrical section of a gun. He has also supplied him with a solution of the question of what must be the *original conditions* of a series of successive rings of which a gun might be composed, so that on a given internal pressure (from the explosion of the powder) being applied to the internal ring, the *tensions* of all the rings should be the same, which he describes as fulfilling the condition of the gun of greatest strength for a given quantity of material.

Upon the theoretical data thus furnished, Mr. Mallet builds his new theory of constructing a wrought iron gun, the advocacy of which occupies a considerable portion of the book before us, and which, we have already said, is in our opinion more suited to the pages of the transactions of a philosophical society than a treatise which is intended to enjoy more than a very ephemeral existence.

The assumptions on which Dr. Hart's investigations are founded, and the doubtful nature (to say the least) of the ground on which they rest, may be stated in his own words:—"This conclusion depends upon the following admissions; first, that the extending force bears a constant ratio k to the extension; secondly, that the compressing force bears a constant ratio k' to the compression; and, thirdly, that the fracture only occurs when the extension has exceeded the limit m; but it remains still to be proved by experiment whether the resistance to extension is diminished or increased by simultaneous compression in a transverse direction, and *vice versâ*; it seems probable that the effect of either of these forces must diminish considerably the power to resist the other; and if this be so, the resistance of the tube will be lessened; it is also conceivable that a very great compression might of itself produce fracture, that is, disintegration, without any extension; or might (before reaching the crushing limit) make the material more easily broken by a transverse section."

It may be further stated that in order to reduce his final equations to a more manageable form, Dr. Hart supposes that $k=k'$; that is, that the ratios of the forces to the extension or compression in the *tangential* and *normal* directions are equal—an assumption which renders the results of the investigation still less to be relied upon. In a very able review on the work before us, which appeared in the *Civil Engineers' and Architects' Journal* for October last, the Reviewer, who brings very considerable information and mathematical resources to bear on the problem, grounds his investigation on the more extended equations of elasticity given by Cauchy and Professor Stokes. It may be interesting to compare the two methods—of the Reviewer and Dr. Hart—and the inferences they severally draw from their final expressions. But, first, we must remark that the Reviewer is hardly just to Dr. Hart in the following passage:—"Our objection to Mr. Hart's method may be shortly summed up in this, *that he does not investigate the normal compression of the cylinder;* that is, the effect of mutual pressure of the consecutive cylindrical shells above mentioned, by which the extension of one produces extension of the others." Dr. Hart *does* investigate the normal compression, or rather he introduces into his equations the modification produced by these normal compressions, without which, indeed, his equation would be insoluble. And what is more remarkable, the final expressions of both, as we shall see, are absolutely identical, which could hardly have been the case had either of them omitted any important condition of which the other had taken notice.

We shall first give the outlines of Dr. Hart's method. A tube, supposed to consist of a series of concentric shells, has an internal pressure applied to the inner surface; it is required to determine the pressure on any one of the other shells, and the elastic force caused by the expansion. The tube being supposed free from any strain; assuming r and R the radii of its inner and outer surfaces, and a pressure of F tons per square inch applied to the inner surface; this pressure will extend the inner shell, and cause it to press with a pressure F′ on the shell next it, and so on.

Assuming, then, again x to be the radius of the inner surface of any one of these shells; $x+dx$ the radius of its outer surface (the shell being supposed indefinitely thin,); f and f' the corresponding pressures; δ the increase of the radius x caused by the extension; and k the ratio of the elastic force to this extension; he obtains on the usual method the equation, putting $fx=\text{P}$,

$$d\text{P}+k\frac{\delta}{x}dx=o \quad . \quad . \quad . \quad . \quad . \quad (1).$$

Also if k be the ratio of the resistance to compression to the compression in the normal direction by which the pressure from one shell is communicated to the other, we have

$$f = \frac{P}{x} = -k'\frac{d\delta}{dx} \quad . \quad . \quad . \quad . \quad (2)$$

Whence, assuming $k=k'$, combining these equations, integrating, and eliminating the constants by the conditions that when $x=R$, $P=o$, and when $x=r$, $P=Fr$, we get finally

$$P = Fr\frac{R^2-x^2}{R^2-r^2}\cdot\frac{r}{x} \quad . \quad . \quad . \quad . \quad (3)$$

and the resistance to extension

$$=\frac{k\delta}{x} = -\frac{dP}{dx} = F\frac{R^2+x^2}{R^2-r^2}\frac{r^2}{x^2} \quad . \quad (4)$$

and if T be the limit of the value of this force, which is evidently greatest when $x=r$, he obtains

$$T = F\frac{R^2+r^2}{R^2-r^2} \quad . \quad . \quad . \quad . \quad . \quad (5)$$

$$\text{or } F = T\frac{R^2-r^2}{R^2+r^2} \quad . \quad . \quad . \quad . \quad (6)$$

The Reviewer starts with the experimental fact, that when the cubical extension is introduced, the additional tension in the direction of each of the three adjacent sides of a cube (that is, beyond that given by Hooke's law) is approximately in a constant ratio to the cubical extension. The ratio by Hooke's law being e, and the ratio for additional tension, which is the same in all directions, being E; if the dimensions of the cube be unity; c, the cubical compression; l, n, t to the tensions on three contiguous faces of the cube; λ, ν τ, the displacements produced by them: then

$$\left.\begin{aligned} l &= Ec+e\lambda \\ n &= Ec+e\nu \\ t &= Ec+e\tau \end{aligned}\right\} \quad . \quad . \quad . \quad . \quad . \quad (7).$$

Where we observe that, putting out of the question the cubical extension these three equations *exactly* correspond with those assumed by Dr. Hart, on the assumption that $k=k'$, except that Dr. Hart takes no notice of the longitudinal tension and compression.

Since the first term of $c=\lambda+\nu+\tau$, we get

$$l = E(\lambda+\nu+\tau)+e\lambda \quad . \quad . \quad . \quad . \quad (8).$$

Assuming one of these tensions, l, and the compression, λ, in the same direction constant, the Reviewer gets $\nu+\tau=$constant, and hence deduces from the two last equations (7)

$$\text{that } n+t = C \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (9)$$

Applying these considerations to the case of the tube, he gets (since n is negative and becomes $-n$) if r be the inner radius of any of the shells into which it may be supposed divided

$$t+n = -r\frac{dn}{dr} \quad . \quad . \quad . \quad . \quad . \quad (10.)$$

Also from (9)

$$t-n = C \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (11).$$

$$\text{Whence } 2n = -r\frac{dn}{dr} - C$$

Integrating this equation, we get

$$n = -\frac{c}{r^2}-\frac{c}{2}$$

Supposing that R and a are the outer and inner radii of the tube; and p the unit of pressure on the latter; and introducing the conditions that when $r=a$, $n=p$; when $r=R$, $n=o$. He obtains finally

$$n = \frac{a^2}{r^2}\,\frac{R^2-r^2}{R^2+a^2}.p \,\ldots\ldots\ldots (12)$$

$$t = \frac{a^2}{r^2}\,\frac{R^2+r^2}{R^2-a^2}.p \,\ldots\ldots\ldots (13)$$

Also, if T be the tension of ultimate rupture

$$T = \frac{R^2+a^2}{R^2-a^2}.p \,\ldots\ldots\ldots (14)$$

Comparing Dr. Hart's equation (4) and (5) with the Reviewer's (13) and (14), we perceive that, *mutatis mutandis*, they are absolutely identical.

We may also observe that, on Dr. Hart's notation, since the resistance to compression in the normal direction

$$= -\frac{k'd\delta}{dx} = \frac{P}{x} = F.\frac{r^2}{x^2}\,\frac{R^2-x^2}{R^2-r^2};$$

calling this n, being identical with n on the reviewer's notation,

$$n = F\frac{r^2}{x^2}\,\frac{R^2-x^2}{R^2-r^2} \,\ldots\ldots\ldots\ldots (15.)$$

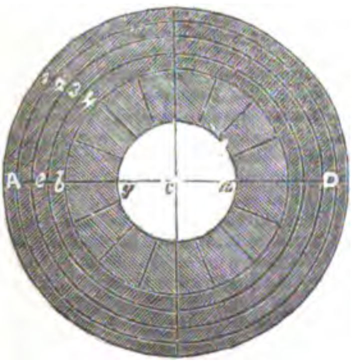
which is identical with equation (12) of the reviewer. The Reviewer was therefore evidently premature in finding fault with Dr. Hart's investigation. The only legitimate inference he could draw was that his assumptions and Dr. Hart's are physically, though not in terms, identical.

Although, however, as we have shown, the results of both investigations are absolutely identical, we confess to an inclination to give the preference to that of the Reviewer, as being in accordance with the more extended principles of elastic forces propounded by Cauchy and Professor Stokes.

We have thought it within our province to institute this comparison between the rival methods in order to vindicate Dr. Hart from the unjust attack of the Reviewer, who had evidently failed to take the pains to make himself master of the former gentleman's investigation.

To the remainder of Dr. Hart's communication we are quite unable to give in our adherence. The formulæ already obtained appear to us to show, as the Reviewer rightly states, that it is absolutely impossible, under any circumstances, that a gun, composed of a series of shells, can be of uniform tension throughout. Dr. Hart assumes that this condition can be fulfilled, and on that *assumption* gives an equation which correctly represents that condition; but we believe the *assumption* to be entirely erroneous. Those equations, therefore, which are intended to show the original distribution of pressure which leads to this result, and which are derived from a combination of two equations, one of which supposes the tension uniform, and the other is incompatible with this assumption, can lead to no reliable results.

It is now time to consider what form, in accordance with the above theory, Mr. Mallet proposes to give to a wrought-iron gun, in order to secure the greatest strength with the least quantity of material. To this end he proposes a "built-up wrought-iron gun," the interior to consist of "a number of longitudinal prismatic bars of metal parallel to the axis of the gun, and forming a cylinder of equal voussoirs." These are to be "grasped externally by a set of successive closely-fitting cylinders, whose total thickness is A*b* (see figure), and of which the inner half of their total number (3 and 4) is in a state of compression, while the outer half (1 and 2) is in a state of extension." The circular rings are to be "shrunk on at a suitable heat." His opinion is that



by causing "each successive cylinder to grasp and compress the preceding ones within it with a force inversely proportionate to that with which it will be afterwards extended, we should have attained, *at a certain pressure*, a perfectly equal extension for all the successive cylinders, so that their united resistances might be considered as centred in the middle point, *e* or D; and hence that the whole section of metal due to the gun's thickness, from *g* to A would be equally effective in resisting the internal pressure as though its resolved forces produced a straight pull on the tangent at *e* perpendicular to A D, and that the metal of the gun were a straight bar of the breadth, A *g*, and unit of depth resisting in the opposite direction, but in the same line."—(P.147—149.)

The Reviewer considers this a fallacy; for he apprehends that the equation (4) or (13) denotes a physical condition which is utterly inconsistent with such a presumed state of things. And he further states that "*in no case do the relative degrees of tension of the built-up gun depend on the tensions with which the rings are successively fastened on.*" These tensions will in all cases adapt themselves to suit the general formula (13). We quite agree in this conclusion as regards the *relative* degrees of tension. There can, however, be no question that the *absolute* degrees of tension may be altered *ad libitum* by the contrivance of shrinking on at different temperatures. This, we do not apprehend, the Reviewer denies; but it appears to us that Dr. Hart understands him as speaking of absolute as well as relative tensions; for his remarks in reply on this point all tend to prove the possibility of altering the absolute tensions—a point allowed, apparently, on all hands, and which is not that in dispute.

If the tangential tensile force were independent of the normal tensile force (which cannot be allowed on the assumptions made in either of the solutions, or any of the conditions of elasticity derived from experiment), the question would be denuded of the greater part of the difficulties which now surround it. It appears plain to us, that in the caes, of the built-up gun with its rings successively shrunk on, there will be a normal strain arising from the exterior rings grasping the interior ones, which will go on increasing from the exterior to the interior. When the explosion takes place, there will be an additional normal pressure of the same kind; and as each of these tends to *compress* the metal, the total normal compression will be due to the *sum* of these causes. Whether this total normal compression may not be in itself dangerous, and how far it may operate in diminishing the power of resistance in the *tangential* direction, we are not in a position to determine.

The system of construction advocated by Mr. Mallet is one very proper to be brought forward and discussed in a suitable place; and probably considerable time will elapse

before any definite decision, *pro* or *con*, can be pronounced. Without going with the Reviewer to the full extent of his remarks, we cannot deny that there is considerable force in his objections. It is a remarkable circumstance, illustrative of the sad tricks which the spirit of controversy plays with the judgment of even usually sound-thinking, able, and well-informed men, that while the Reviewer, as we have seen, wrongly objects to Dr. Hart the neglect of the normal compression, the latter disputes the truth of the equation

$$t-n=C.$$

Now if we subtract (15), which gives his expression for n, from (4), which gives the expression for t, we get

$$t-n=\frac{2\,F\,r^2}{R^2-r^2},$$

a constant quantity. In other words, the Reviewer's fundamental condition, to which Dr. Hart objects, appears as *a consequence* of the investigations of the latter gentleman!

We shall not dilate on Mr. Mallet's confusion in the use of mechanical terms to which we have alluded. We can only repeat our regret that he did not keep the two portions of his work separate, and so spare us the disagreeable task of qualifying our praise with blame, and of cautioning our readers against an implicit reliance on all the conclusions at which he arrives, whilst we readily concede to those which refer to the constitution of iron the merit of being able, clear, and sound, and of placing that important question on a more satisfactory footing than has been hitherto attempted.

NEW EDUCATIONAL MUSEUM.

The Committee of Privy Council on Education have arranged to open the New Educational Museum at the New Buildings, South Kensington, in the spring. It is hoped that the museum will afford great help to all classes of the public in carrying out the work of national education, and especially those engaged in teaching. The museum will exhibit, under a proper classification, all important books, diagrams, illustrations, and apparatus connected with education already in use or which may be published from time to time, either at home or abroad. The public will be admitted free as a public exhibition on certain days of the week; and on other days, which will be reserved for students, opportunity will be given to examine and consult the objects with the utmost freedom. The objects exhibited at St. Martin's Hall in 1854, which were presented to the Society of Arts, and by that society given to the Education Board in order to found a museum, will form part of the Educational Museum. The producers of apparatus, books, diagrams, maps, &c., used in teaching, will have the privilege—subject to certain regulations—of placing their publications and productions in the museum, and thus making them known to the public; and we understand that a unanimous desire to assist has been expressed by all the great educational societies and publishers. A catalogue will be prepared, which will contain the price-lists which exhibitors may furnish for insertion. The books and objects will be grouped under the following divisions:—1. School buildings and fittings, forms, desks, slates, plans, models, &c. 2. General education, including reading, writing, grammar, arithmetic, mathematics, foreign languages, histories. 3. Drawing and the fine arts. 4. Music. 5. Household economy. 6. Geography and astronomy. 7. Natural history. 8. Chemistry. 9. Physics. 10. Mechanics. 11. Apparatus for teaching the blind and the deaf and dumb.

INVENTORS' MUSEUM AND LIBRARY AT KENSINGTON GORE.

In compliance with Memorials received by His Royal Highness Prince Albert, by the Commissioners of Patents, and by the Lords Committee of Privy Council for Trade, from the Society of Mechanical Engineers, and from Manchester, Glasgow, Birmingham, Sheffield, Leeds, Nottingham, and other large towns, the Commissioners of Patents have undertaken the formation, in connection with the Great Seal Patent Office, of a Museum of Models of Patented and other Inventions, and of a Library of Works on subjects relating to the Industrial Arts.

Space has accordingly been allotted in the Museum Building at Kensington, by the Lords Committee of Privy Council for Trade to the Commissioners for the above objects, and of which they have availed themselves. The building being now ready, such possessors of models as desire to have them exhibited in the Museum at Kensington may ascertain what space can be allotted them, on application by letter to B. Woodcroft, Esq., Superintendent of the Patent Museum and Library, at the Great Seal Patent Office, 25, Southampton-buildings.

The models will be kept in perfect order, and in glass cases when required.

RENNIE'S DISC FIRE ENGINES.

A new kind of pumping and fire engine, made under the direction of Messrs. Rennie and Son, having been ordered by the Lords of the Admiralty for the use of the dock-yard, Woolwich, was subjected on Monday last to a first trial under the inspection of Mr. Atherton, superintending engineer of the yard, assisted by Mr. Taplin and others of the department. The principal object for which the new engine is purchased is for draining the caissons at the mouth of the basins, as well as to use in case of fire. It is of very small dimensions. The system is that of the disc, and the engine drives a pump at the average rate of about 300 revolutions per minute. The diameter of the engine itself is only 13 inches; its height, together with the framework and carriage, is 6 feet, and length 6 feet, the whole, together with the boiler, weighing only two tons. The pump was driven at the rate of from 300 to 400 strokes per minute, and answered the expectations formed as to its capabilities admirably. The facility of transporting the engine while under the action of performing its ordinary revolutions renders it available in any spot required without stopping the machinery. It was estimated that the column of water projected during the trial to the height of from 120 to 130 feet was at the rate of 30 tons per hour. The power of the engine is about six horses.

EXHIBITION OF INVENTIONS AT THE SOCIETY OF ARTS.

The Council of the Society of Arts have fixed Monday, the 23rd of March next, for the opening of the ninth annual exhibition of recent inventions.

Persons intending to contribute to the exhibition should communicate with the secretary forthwith, stating—

1. The title of the invention.
2. Whether the article will be a specimen, model, or drawing.

Articles for exhibition must be forwarded to the house of the society, *carriage paid*. The days for receiving articles are Thursday, the 5th, Friday, the 6th, and Saturday, the 7th of March.

All articles should be accompanied with a short description of the invention, for the catalogue, with a wood block (when possible), and a reference to any publication where a fuller account may be found.

IRON DISCOVERIES.

The discoveries of iron in the neighbourhood of Seend, Wiltshire, go on, and several furnaces are about to be erected at once. Various persons are testifying their belief in the value of these discoveries by offering fabulous prices for land at Seend and the neighbourhood. The Duke of Somerset and the trustees of the late Mr. Ludlow Bruges own about half the land at Seend where the richest ore is found, and the Duke's agent is collecting the best information that can be obtained in reference to the extent and value of the iron which has been discovered.—*Times.*

STEAM SHIP ARITHMETIC.

To the Editor of the Mechanics' Magazine.

Sir,—In a paper read by me at the meeting of the British Association at Cheltenham, in August last, on "Mercantile Steam Transport Economy," I brought before public notice that a system of steam ship arithmetic might be based on the formula usually adopted for determining the co-efficient or index number of dynamic duty of steam ships, namely,

$$\frac{V^3 D^{\frac{2}{3}}}{\text{Ind. h. p.}} = C,$$

the numerical values of "C" having been experimentally determined for vessels of the different types of build for which the arithmetical calculations may be required. This paper has led to many inquiries of me for more specific information as to the mode of applying the formula, such, for example, as the letter of "Enquirer" in the *Mechanics' Magazine*, No. 1745, namely, "I shall feel obliged if Mr. Atherton will inform me whether, by the co-efficient of dynamic performance, he means the useful effect, or if not, what it refers to." I am glad to find that the subject "Steam Ship Arithmetic," based on the mutual relation of displacement, power, and speed, as dependent on the locomotive or dynamic qualities of the vessels employed to do the work of mercantile transport service, and for which in the end the public have to pay the cost, whether done ill or well—the difference between doing the work ill or well, involving probably millions per annum—is now at length attracting public attention. I have, therefore, much pleasure in responding to the inquiry thus publicly made, by explaining the views which I entertain, defining, to begin with, that V is intended to express the speed in knots or nautical miles of 2028 yards per hour, D the displacement expressed by the number of tons weight of water which the hull of the vessel displaces at the time of trial, allowing 35 cubic feet of water to the ton, and indicated horse power is the gross working power, as measured by the unit equivalent to 33,000 lbs. raised 1 foot high per minute. Hence, the

co-efficient "C," or index number x, is a mere numerical indication which will be a constant number for vessels of the same type, but not necessarily a constant number for vessels of different types. It, therefore, when deduced from vessels of different types, becomes a series of index numbers "x," whereby we may be able to compare the adaptation of ships of dissimilar type for the performance of gross locomotive or dynamic duty, including the locomotion of the respective ships themselves, propelled by the engines at such rate of speed as may be; and in all this, it is supposed that the net effective power of the engines is in a constant ratio to the gross indicated power.

The numerical values of the coefficients or index numbers "x" being thus practically ascertained by the actual trial of ships of known constructive elements or types of build, the index number of any particular ship may then be applied as a constant number, not to vessels indiscriminately, but to vessels of *similar types of immersed form*, whatever be the immersed displacement "D," intended speed "V," or intended working power "indicated horse power"; thus completing the equation

$$\frac{V^3 D^{\frac{2}{3}}}{\text{Ind. h. p.}} = C,$$

from which any two of the three quantities V, D, and indicated horse power being given, the third may be found, as will be hereinafter exemplified. It is thus only by having ascertained the coefficients or index numbers actually realized by vessels of known types, that we are enabled to assign the coefficient that an intended vessel about to be constructed may be expected to realize. It is my conviction that neither mathematical investigation nor legislative intervention, will by itself alone be adequate for realizing perfection in naval construction. Experience must be resorted to, and made available as above set forth; but I believe that mathematical investigation combined with a complete system of statistical registration giving us the ordinary load displacement of ships and the available working power of steam ships expressed by their indicated power or any other definite unit, will do a great deal towards enabling us to realize, appreciate correctly, and bring to book, the results of experience, and thence by an analysis and comparison of the distinctive elements of dissimilar vessels, of which in each case the index number has been determined, we may be led to discover and adopt the elements of build which conduce to efficiency for any particular service, and reject all dogmas thus found to be practically ill adapted for the production of dynamic efficiency. Such is the primary use of the formula

$$\frac{V^3 D^{\frac{2}{3}}}{\text{Ind. h. p.}} = C.$$

It enables us to assign definite index numbers or numeral values to the performance of steam ships, instead of the general panegyrics in which the trial performances of new steam ships are usually spoken of. The coefficients "C," or, as I have called them, the index numbers x, produced by vessels of dissimilar types and of dissimilar engine construction vary greatly. The index number "x," is sometimes as low as 120, frequently as low as 150; it frequently reaches 200, and, in some cases, the index number 250 is said to have been attained. I believe that at the present time it is more frequently below 200 than above that number, and as the index number is affected not only by the type of form and smoothness of the hull at the time of trial, but is also dependent on the greater or less efficiency of the engines (for the indicated horse power is the measure of the gross power, not of the net effective working power of the engines,) it is evident that in the case of a vessel not realising so high an index number as may have been expected from her type of form, it will become a subject of professional inquiry, whether the deficiency be attributable to the hull or to the engines.

It is further an important matter in favour of this principle of determining the comparative locomotive merits of steam-ships that, by substituting the consumption of coal W, expressed in cwts. per day of twenty-four hours, the merchant will have the means, based on his own counting-house data, of testing the performance of his steam-ships, and of determining whether the success or failure of any particular service may be attributable to the constructive qualities of the vessel, or to her mercantile management. This view was brought forward in my Essay on Steam-ship Capability, second edition, Appendix No. 4; and on this matter I observed in my Cheltenham paper as follows:

"Further, this formula may be rendered available as a counting-house check on the working operation of steam-ships, simply by substituting the consumption of coal expressed in cwts. per day of 24 hours 'W,' in lieu of the indicated horse power; for, 1 cwt., or 112 lbs. per day of 24 hours, is at the rate of 4·66 lbs. per hour, which is probably about the ordinary consumption per indicated horse power per hour, and it ought not to be exceeded. If, therefore, in lieu of the indicated horse power, we substitute the consumption of coal calculated

in cwts. per day of 24 hours, the resultant co-efficient "C" will afford an approximate indication of the good or bad performance of ships, as compared one with another; and the fact of an inferior performance being thus detected, the cause to which it may be attributable, whether to inferior type of form, or foulness of bottom, or inferior adaptation of engine, or inferior construction of boiler, or inferior management on board of ship, will then become the subject of professional inquiry: thus, the merchant, by aid of his counting-house statistics of displacement, time on passage of given length, and coal consumed, will be enabled to detect the fact of inefficiency, and it will then be for the professional engineer to detect and remedy the cause thereof."

The enunciation of the formula, or the mercantile rule above referred to, is as follows:—Multiply the cube of the speed, expressed in knots or nautical miles per hour (V^3), by the cube root of the square of the displacement ($D^{\frac{2}{3}}$), and divide by the consumption of coal, expressed in cwts. per day of 24 hours, the resultant numeral co-efficient "C" will indicate the dynamic or locomotive efficiency of the vessel; and such is the variable condition of steam-ships in present use, that the co-efficient has, as I have said, been found to be as low in some cases as 120, whilst in other cases it has reached the number 250.

Now, as an example of the application of the formula

$$\frac{V^3\,D^{\frac{2}{3}}}{\text{Ind. h. p.}}=C:$$

Suppose a vessel about to be constructed 175 feet length on deep draught water line, 25 feet breadth, and 10 feet draught of water exclusive of keel, to be built on lines which give a displacement of 500 tons at the draught referred to, and that from previous experience of the type of build or comparison with vessels of a similar type, we have reason to expect that the co-efficient or index number will be 200, and we wish to know what amount of indicated horse power will propel the vessel at the speed of fourteen nautical miles per hour.

In this case

$$\frac{V^3\,D^{\frac{2}{3}}}{\text{Ind. h. p.}}=200;\ \text{or ind. h. p.}=\frac{V^3\,D^{\frac{2}{3}}}{200}$$

$$=\frac{(14)^3.500^{\frac{2}{3}}}{200}=\frac{2744\times63}{200}=864.$$

That is, the engines, whatever may be their *nominal* power, must be capable of working up to 864 indicated horse power to propel the vessel at the speed of fourteen nautical miles or knots per hour.

If the intended speed be fourteen *statute miles* per hour, which is equal to 12·15 knots, then we have

$$\text{Ind.h.p.}=\frac{(12{\cdot}15)^3\times500^{\frac{2}{3}}}{200}=\frac{1794\times63}{200}=565$$

being 300 indicated horse power less than is required to attain the speed of fourteen *nautical miles*, and yet "miles" are frequently spoken of without any distinction being made as to whether nautical miles or statute miles are intended!

I am, Sir, yours, &c.,
CHAS. ATHERTON.

Woolwich Dockyard, Jan. 27, 1857.

CORNISH PUMPING ENGINES.

To the Editor of the Mechanics' Magazine.

SIR,—In No. 1734, I drew attention to the great falling off in the duty or performance of the Cornish pumping engine of the present day, as compared with the performance of engines more than twenty years ago. To restore their engines to the state of efficiency bequeathed them by their predecessors seems beyond the ability of the Cornish engineers. To show that these gentlemen are not deficient in ingenuity, I may now inform your readers that they have hit on the happy expedient of making the bushel larger, and thus convey to the uninitiated the impression that the engines are improving in efficiency. The last monthly report of the western engines has the "duty" calculated on an unit of 112 lbs., but for more than thirty years previously it had invariably been calculated on an unit of 94 lbs. (the old Cornish bushel). Why the alteration should have been made so soon after the publication of my letter, I must leave your readers to guess. It is an indirect admission of the truth of my charges, that the duty is retrograding with astounding rapidity. Verily the notion of having a sliding scale to the unit of efficiency to compensate for the degeneration amongst Cornish savans is worthy of dealers in old iron.

I am, Sir, yours, &c.,
COSMOPOLITAN.

January 10, 1857.

THE "DERIVATION" OF PROJECTILES.

To the Editor of the Mechanics' Magazine.

SIR,—Your intelligent correspondent, Mr. W. M. B. Hartley, in his interesting letter on rifled ordnance, in your Number 1744, has committed an error, I fear, in speaking of "the spiral or corkscrew motion, known by the French as *derivation*."

On turning to Captain Jervis-White Jervis's "Rifle Musket," a "Practical Treatise on the Enfield Pritchett Rifle," page 58 (a treatise which would have been much less defective than it is, had the author been a practised mathematician), I find the author, after describing the motion of an elongated shot, the point of which lies above the line of flight (or trajectory), says:

"The lower side of the projectile, therefore, moving in compressed air, and the upper in rarefied, deviations must ensue. For, as the upper part of the bullet moves from left to right" (by virtue of its rotation about its axis) "the bottom must move from right to left. But the lower resistance to the motion of rotation being produced by the friction of the compressed air, is greater than the upper resistance, which depends on the friction of the rarefied air. By combining these two resistances, there results *a single force acting from left to right*, which produces what Capt. Tamisier termed *derivation*."

Now, if Captain White be right—and I have independent reason to believe that he is—Mr. Hartley must, I submit, be wrong; for a single force acting in one direction would produce, not a spiral motion, but a continuous deviation in one direction.

I am, Sir, yours, &c.,

Jan. 12, 1857. SPECTATOR.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

WILKINSON, G. *Improvements in steering apparatus, and in giving motion to machinery for raising and moving weights.* Dated May 20, 1856. (No. 1188.)

A ring is formed with internal, oblique teeth, either all or partly round the interior, according as the motion should be continuous or alternating. When for steering, the teeth are partly around the ring, and such ring is fixed to the tiller head by a half spherical or hollow metal basin to contain lubricating matter. On the axis used to give motion to the ring a disc is fixed, of a diameter about equal to the diameter of the ring within the teeth, and on such disc are formed portions of the worms of a threaded screw.

MAXWELL, R. *Improvements in the construction of taps for drawing off liquids.* Dated May 20, 1856. (No. 1190.)

This consists in so constructing such taps as to enable them to be readily connected with a vent peg. The vent peg is hollow, and connected by a piece of elastic tubing with the tap by an orifice formed across the plug, at about right angles to, and independent of the orifice by which the liquid passes.

GOLLOP, J. A. *An improved method of excluding dust, water, air, and other extraneous matters from doors, windows, glass show-cases, and such like constructions.* Dated May 20, 1856. (No. 1191.)

This relates—1. To doors, and consists in adapting thereto vulcanized India-rubber, or other suitable elastic tubing of small size, so that the closing of the door compresses the tubing. 2. The patentee adapts elastic tubing to windows, glass show-cases, and such-like constructions as described.

MCBRIDE, W. C. *Improvements in machinery for scutching flax, and other vegetable fibrous substances.* Dated May 20, 1856. (No. 1193.)

This invention was fully described and illustrated at page 49 of our last Number.

NEWTON, A. V. *An improved mode of preparing the double chlorides of aluminium and sodium, and aluminium and potassium.* (A communication.) Dated May 20, 1856. (No. 1194.)

The patentee describes a process designed to obtain directly and by a single operation the double chloride which is to be employed in the production of aluminium, or for any other purpose.

NEWTON, W. E. *Improvements in the process of manufacturing oil from seeds, and in the machinery and apparatus to be used therein.* (A communication.) Dated May 20, 1856. (No. 1195.)

This consists—1. In constructing the bed of a chasing mill so that it can be heated and kept hot by the application of steam, while it is used to grind, temper, &c., and in making chasing mills self-feeding, by means of circular troughs around the shaft. 2. In pressing the pulp of prepared seeds or substances into cakes, which occupy only one-half the space required for such pulp in the press which expresses the oil from it. 3. In machinery for packing the pulp into cakes preparatory to pressing, so as to make them occupy less space. 4. In certain improvements in the presses, for expressing the oil.

NEWTON, A. V. *An improved rotary pump.* (A communication.) Dated May 20, 1856. (No. 1196.)

The rotary pump consists of a cylinder with a partition at the middle, a plunger in each end, and a valve leading from each side of the partition into a pipe attached to the middle of the cylinder, and stands perpendicular to the axis thereof, so as to form a hollow shaft, to which the two parts of the cylinder are radial. The pistons are connected by rods outside the cylinder, and the cylinder is placed horizontally within a curved frame below the water in the well (or other source), with the pipe in a vertical position, and leading to the mouth of the well. The pipe has a rotary motion imparted by a hand crank, and the two parts of the cylinder, with their pistons, are thus caused to revolve around it, and the ends of the plungers to work in contact with the

curved frame, so that the pistons receive a simultaneous reciprocating motion within the cylinders, and force the water up the pipe.

SHAW, D. *Improvements in looms and apparatus employed therewith for weaving.* Dated May 21, 1856. (No. 1198.)

This invention relates—1. To an improved stop motion by which the loom is instantly stopped if any of the warp threads break, or anything becomes entangled in the warp threads. 2. To an improved construction of the healds and the method of making the same. 3. To an improved construction of the shuttle tongue and spring.

PEMBERTON, R. *Improvements in barrel organs.* Dated May 21, 1856. (No. 1199.)

This consists in constructing barrel organs with a sufficient number of pipes that will produce all the tones and semitones, so that the barrels can be furnished with the chromatic scale.

DUFRESNE, A. H. *An improved process of gilding and ornamenting steel and other metals.* Dated May 21, 1856. (No. 1201.)

This relates to gilding, silvering, and ornamenting metals not susceptible of direct amalgamation, and consists—1. In employing intermediate metals anyhow deposited on to the metal to be treated. 2. In applying a protecting matter, such as varnish, bitumen of Judea, &c., upon the intermediate metals, to form the reserves to be gilded, &c., such reserves being produced photographically. 3. In destroying the intermediate unreserved metals by suitable baths. 4. In removing the protecting matters. 5. In gilding or silvering the surfaces by means of mercury. 6. In volatilising the mercury by heat.

COPE, J. *An improvement or improvements in the manufacture of buttons made of pearl or other shell, ivory, bone, or wood.* Dated May 21, 1856. (No. 1202.)

The patentee makes the buttons of two pieces or discs, one forming the front and the other the back; the latter has a perforation at its middle. He places between the two discs a piece of canvas or other fabric, a portion of which protrudes through the hole in the back, and constitutes a flexible shank.

ALLAN, A., and T. HUNT. *Improvements in the construction of locomotive and other steam engines and carriages, and in the rolling stock of railways.* Dated May 21, 1856. (No. 1206.)

The patentees claim certain modes of arranging plate springs. A mode of constructing buffer, hauling, and supporting springs of planks or beams of timber; a mode of constructing the cranks of axles for locomotive engines, by shaping the cranks by hammering or otherwise, out of a nearly straight forging, so that the line of the fibre of the iron may follow the bend of the crank; a mode of applying glass to the working faces of slide and other valves, and other sliding surfaces; certain valvular mechanism for the working cylinders of steam engines, and mode of supplying fresh fuel to the fires of boilers, by introducing it below the incandescent fuel, or behind the transverse mid feather; a mode of aiding the economical combustion of fuel gases in boilers by supplying fresh or green fuel in such manner that the fuel gases are compelled to pass through or in contact with the incandescent fuel in front of the bridge or transverse mid feather; a mode of preventing the burning and deterioration of the bars of locomotive furnaces, and of obtaining a constantly clear fire, by giving motion to the fire bars; and a mode of arranging and constructing the grate details of locomotive furnaces, so that the grate surface can be raised or lowered at pleasure by the attendant, in combination with any contrivance for giving motion to the fire-bars.

HERON, G. *Improvements in machinery or apparatus for raising, lowering, moving, or transporting heavy bodies.* Dated May 21, 1856. (No. 1207.)

This relates to arrangements of wheels and pulleys actuated by pistons and piston-rods, working in cylinders for the above purpose. In one modification the piston-rod is connected to a chain or rope, coiled round a small pulley, on the axis of which is a larger pulley. To this large pulley is attached the twisting-chain or rope, which leads direct to a crane-post or jib, or other such place. A large amount of chain or rope may be hauled with a comparative short stroke of the piston, the difference being due to the relative diameters of the two pulleys.

NEILSON, M. *Improvements in the treatment, preparation, or finishing of yarns or threads.* Dated May 21, 1856. (No. 1209.)

The yarn may be in various stages, and taken from various spinning machines. If mule cotton yarn, the cops, when removed from the spindles, are steamed or boiled, boiled in starch, wound on to bobbins, and put into a twisting machine. As it passes off from the bobbins the yarn is passed through starch or dressing material to a flyer arranged simply to twist it and wind it on bobbins, as in the common throstle. A high degree of twist is given to the yarn, which is then reeled, warped, or otherwise applied. The yarn acquires a fine finish.

JONGH, C. DE. *An improved method of separating and assorting combed fibres of*

different lengths. Dated May 21, 1856. (No. 1211.)

The patentee lays the stricks of combed fibres on holding surfaces, constructed for retaining the shorter fibres, and he draws out first the longest of the fibres from the opposite ends of the strick, then the next longest, and so on, until all the lengths are removed. *Claims.*—1. Treating combed fibres as described. 2. The use of a tapering combed surface for presenting combed fibres to a series of nipping or drawing off rollers arranged on opposite sides of the taper comb.

LAWRENCE, T. *Improvements in machinery to be used for grinding and polishing gun barrels, swords, matchets, bayonets, scythes, fire-irons, and other articles similar in transverse section to any of those above named.* Dated May 21, 1856. (No. 1212.)

The patentee is enabled to grind, not only the plain surfaces of the above articles, but also to grind out of the solid metal the furrows, ribs, or grooves required, or to grind the said furrows, &c., after the same shall have been rolled or forged in such articles. The machinery cannot be described without illustrations.

BENTALL, E. H. *Improved machinery for crushing or splitting grain or seeds.* (A communication.) Dated May 21, 1856. (No. 1213.)

The patentee mounts on an axle a series of serrated discs, and sets between them washers of superior thickness, to provide spaces between the discs. Another axle is provided with a similar arrangement of discs and washers, arranged to admit between the discs of one axle the cutting edges of the second series. These two sets he mounts in bearings at the bottom of a hopper or box into which is placed the grain or seeds. The axles are geared together, and rotary motion is imparted.

GALLOWAY, W. and J. *Improvements in steam boilers.* Dated May 22, 1856. (No. 1217.)

The patentees construct boilers with furnaces, whence the products of combustion pass first up and down conical pipes, surrounded by water, and with their small ends upwards, and then pass through horizontal or inclined tubes surrounded by water.

HUBERT, A. *An improved apparatus for ventilating ships or vessels.* Dated May 22, 1856. (No. 1218.)

This invention was described and illustrated at page 8 of No. 1743.

PEARCE, J. C. *Improvements in apparatus for generating and economizing steam.* Dated May 22, 1856. (No. 1219.)

This invention relates—1. To improvements in the construction of boilers, furnaces, and flues. The patentee employs T-shaped ribbed and other sections of iron, which, being bent into rings, loops, or otherwise, are riveted to the edges of the adjoining plates, or of each other, as the case may require, to give the necessary strength to fire-boxes, flues, &c. In some cases he bends the edges of the ordinary boiler plate parallel with the rivet holes. Also to certain improved flues, a new form of boiler, with a double set of furnace bars, &c. The second part relates to slide valves. To get rid of the friction, and consequent loss of steam, he employs a loose adjustable plate, kept in contact with the back of the valve by adjusting screws passing through the valve-case. The valve is a simple frame, its front and back faces being perfectly parallel and similar. In the adjustable plate, on its side next the valve, compensating recesses are formed opposite and similar to the steam ports. Steam from the boiler is conveyed to the interior of the valve, instead of into the valve-box, where it acts with full pressure upon the adjustable plate, tending to force it off the valve, and thus holding it firm against the adjusting screws, while the valve is at liberty to slide easily. The third part relates to improvements in the construction of metallic packing for pistons. He forms a groove or grooves round the inner surface of the packing ring for the reception of other rings, which act as springs to force the packing ring against the surface of the cylinder.

HODGES, W. R. *Improvements in machinery or apparatus for manufacturing loop-pile fabrics.* (A communication.) Dated May 22, 1856. (No. 1220.)

This consists in interlooping a single or second thread in the common process of knitting, so that a loop shall pass through every alternate loop of each range of loops. A thread extending across the loops, and projecting from the surface of the knitted fabric made by the thread which is interlooped, termed the "napping thread," causes a pile to be raised by means of a napping cylinder.

DEMPSEY, W. C. *A compound for removing all obstructions of the air passages.* Dated May 22, 1856. (No. 1221.)

The patentee forms a compound of tincture of squills, rectified spirit of wine coloured, compound spirits of ammonia, tincture of Cayenne pepper, and pure water, and calls it Ramah Droogh.

TOLHAUSEN, A. *Improvements in clockwork, part of these improvements being applicable to other regulating purposes.* (A communication.) Dated May 22, 1856. (No. 1222.)

The object here is to produce a universal regulator for all kinds of clock-work to

which pendulums are applicable, and to do away with the frequent winding up of clocks. The invention cannot be described without illustrations.

CUTLER, J. *Improvements in the manufacture of metallic pipes or tubes to be used for various purposes.* Dated May 22, 1856. (No. 1223.)

Claims—1. The manufacture of metallic tubes cylindrical at their inner and taper at their outer surface, by passing the same over a mandril by a series of rollers. 2. The manufacture of tubes cylindrical at their outer surface, and taper on their internal surface, by passing tubes taper outside through grooved rollers or dies. 3. The expanding of bell-mouthed and flanging pipes or tubes by a plug or expanding mandril forced into the ends, in combination with dies or external pressure.

BARRESWIL, C. *Improvements in gas-meters.* Dated May 22, 1856. (No. 1224.)

This consists in employing in gas-meters liquids which do not evaporate or freeze.

BARRUEL, G. *Improvements in treating cotton seed.* Dated May 22, 1856. (No. 1225.)

This consists in obtaining products from cotton seed by distillation. The products are gas for illumination, paraffine, and an oil for lubricating, &c. The residue may be treated to obtain potash therefrom.

BELL, R. *An improvement in the manufacture or production of ornamental fabrics.* Dated May 22, 1856. (No. 1226.)

This consists in the manufacture of a cotton fabric consisting of two piles of cloth or printing surfaces with filling threads or yarns woven in between them, for making the fabric thick and soft or spongy, and preventing the colours printed upon either side passing through to the other; also a similar fabric having both or either of the sides printed.

DEWICK, C., sen. *Improvements in machines, generally called "rib frame or rib machine," for producing fancy hosiery.* Dated May 22, 1856. (No. 1227.)

This invention relates to that portion of the rib machine known as the machine needle bar, and consists in the application of a second or auxiliary bar likewise fitted with needles resting upon, and connected with, the needle bar by suitable hinges. By this combination a new class of loops, called double cross loops, is effected, and a variety of changes in the patterns can be produced.

HOWARD, J., and G. W. BAKER. *Improvements in machinery or apparatus applicable to the tilling of land.* Dated May 22, 1856. (No. 1228.)

This consists—1. In attaching ploughs by ropes or chains to pulleys, mounted on a travelling frame, or at the tail of a locomotive engine, and fitted so as to remain at rest while the frame is traversing the field, but capable of being rotated to bring the ploughs up abreast of each other. 2. Mounting the guide pulleys on a ball and socket joint, to permit them to accommodate themselves to the drag of the ropes or chains leading to the engine. 3. In the application to turn wrest ploughs, having right and left-handed mould boards, of right and left-handed shares, and fitting the same with the mould boards on a swinging neck frame, capable of being held fast. 4. In means whereby the ploughman is enabled to alter the hake while the plough is in motion. 5. In means for raising and lowering the wheels, and enabling the ploughman to regulate the depth of the furrow while the plough is in motion. 6. In the adaptation of a lateral screw for altering the width of the furrow.

RUSSUM, T. D. *A new or improved brake for steam engines and other motive power engines.* Dated May 23, 1856. (No. 1229.)

In this brake there are two discs, having peripheries of a conical figure, the one concave and the other convex, fixed respectively upon a fixed support and the shaft of the engine, the latter being capable of sliding upon the shaft, and of engaging with that on the fixed support; also in shutting off the steam by the brake.

BERRISFORD, S., and E. WILKINSON. *Certain improvements in looms for weaving.* Dated May 23, 1856. (No. 1230.)

This consists in a combination of cams, levers, &c., for changing the position of the drop box containing the shuttles, for the purpose of bringing the shuttles in any required succession in line with the shuttle race.

GEDGE, J. *Improvements in the application of distillation to gas from the furnaces of steam engines.* (A communication.) Dated May 23, 1856. (No. 1237.)

The object here is to obtain gas cheaply from the furnaces of steam engines, and the invention consists in the introduction to the back furnace of receivers or retorts.

HERBERT, T., and E. WHITAKER. *An improvement in the manufacture of warp-lace fabrics.* Dated May 23, 1856. (No. 1239.)

This consists in making enlargements or spots on the pillars of such lace, by accumulating in each case one guide thread on a pillar which is being produced by the linking of another guide thread on a needle or needles.

DIMPFEL, F. P. *Improvements in the construction of screw nuts for axle boxes and other purposes.* (A communication.) Dated May 23, 1856. (No. 1241.)

This consists in constructing screw nuts

so as to prevent their becoming unscrewed or working loose while in use, and consists in the use of a small catch lever or tooth cam, mounted in a recess in the flange of the nut, or of the washers of the nut, to take into the thread of the screw on which the nut is placed, and grip the thread firmly.

Cockkenifeck, J. De. *An improved process and apparatus for preparing, refining, and filtering oils or fatty matters.* Dated May 24, 1856. (No. 1242.)

The oils are first mixed with acids, then the acids are neutralised by alkaline matters, and then the oils or fatty matters are poured through a filter containing a mealy substance placed upon a perforated or porous bed. The oils or fatty matters are forced through some pulverized alkaline earth and the mealy substance.

Barron, P.E.L. *An improved process for coating metals for sheathing ships and for other purposes, and in the means of attaching sheathing plates to ships or vessels.* (A communication.) Dated May 24, 1856. (No. 1243.)

This consists—1. In coating sheets of metal with another metal or alloy, by causing the coating metal to be brought down with pressure on the surface to be coated, or to be drawn over that surface on which, by the friction, the coating metal will be partially fused, and a film deposited. 2. In sheathing ships with plates or sheets, secured to the sides of the ship by metal strips, in which the said plates or sheets are inserted and slidden forward to their proper places.

Illingworth, W. *Certain improvements in printing or colouring and glazing china, earthenware, or other ceramic manufactures, and in the machinery or apparatus connected therewith; and also improvements in the subsequent treatment of such manufactures.* Dated May 24, 1856. (No. 1244.)

These improvements are—1. In the use of the preparation of saccharine matter, as a substitute for oil or other matters now in use in the preparing of the colours for printing, for which the patentee obtained letters patent 1st of October, 1855. 2. In the use of "doctors" in connection with the flat plates used for printing, as in cylinder calico printing. 3. In the removal of the paper which conveys the impression from the ware, by the application of diluted chlorides or acids to the back of the paper, or by dipping the ware in water, or in water mixed with a little mucilage, chloride, or acid. Also, in equalizing the power of suction or absorption of the glaze in the body of the ware with those parts which are printed upon, by dipping the newly-printed ware into water, or water mixed with a little mucilage, chloride, or acid. 4. The ordinary composition of the glaze employed is improved by the admixture of mucilage.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Tevis, C. C. *An improved revolver.* Dated May 17, 1856. (No. 1177.)

This revolver is characterised by the following features—1. An arrangement for pulling the trigger by means of pressure, without having to cock the arm every time it is fired. 2. The facility with which the revolver may be taken to pieces and made up again. 3. The centring of the revolving breech by putting together the parts. 4. The charging at the breech by means of a movable back, the ball being placed in a supplementary chamber behind the recesses of the revolving chamber, and forced from a larger to a smaller diameter. 5. An arrangement for withdrawing the charge without letting the pistol off.

Bowhay, J. L. *Improvements in drills for sowing seeds and distributing manure or water.* Dated May 19, 1856. (No. 1181.)

This relates—1. To a mode of effecting the longitudinal adjustment of the seed or manure box of drills, so as to keep such box level on passing along inclined ground. 2. To an arrangement of gearing for imparting the necessary rotary motion to the seed or manure barrel or shaft of the main supporting or running wheels of the drill, whatever may be the position of such barrel or shaft.

Picciotto, M. H. *Improvements in preparing flax, hemp, and other similar fibrous materials.* Dated May 19, 1856. (No. 1183.)

The fibrous materials are first deprived of their gummy or resinous substances, and then subjected to a process of bleaching by a dilute solution of chlorine, chloride of lime, or soda. The fibres are then washed and dried, and are subjected to the ordinary processes for separating the woody and fibrous matters.

Smythies, J. K. *Improvements in apparatus or instruments for ascertaining the points of the compass, and the latitude and longitude of a place.* Dated May 18, 1856. (No. 1184.)

This consists in employing a rapidly-revolving wheel on gimbals, so that it will place itself with its axis parellel to the earth's axis in such manner that, by measuring the angle which it makes with a fixed point and with the plane of the horizon, the points of the compass and the latitude will be ascertained. By suspending the revolving wheel on gimbals, leaving its axis free to move in any given plane, constraining it to move in such plane, and

comparing the rate of revolution of the wheel's axis with a chronometer, the latitude or longitude will be ascertained.

FOWLER, W., and W. McCOLLIN. *Improvements in portable steam engines, applicable to agricultural and other similar purposes.* Dated May 20, 1856. (No. 1186.)

This consists in attaching to a portable boiler a frame (or saddle) on one end of which are fixed suitable bearings for carrying the trunnions of an oscillating cylinder. On the other end of the frame are situated the bearings of the fly-wheel shaft, upon which, and between the said bearings, is a double crank, to which is connected the piston rod of the oscillating cylinder. The feed pump for the boiler is also fixed to the frame, and is driven direct by an eccentric on the fly-wheel shaft. The slide valve is geared in the ordinary manner.

MAUGHAM, W. *An improvement in rendering cotton and other fabrics and paper uninflammable.* Dated May 20, 1856. (No. 1189.)

This consists in impregnating the above materials with phosphate of ammonia.

TOMS, S. R. *Improvements in gloves.* Dated May 20, 1856. (No. 1192.)

This consists in manufacturing gloves with a small pocket, purse, or receptacle to contain money, railway tickets, memoranda, and other small articles.

CASTRO, J. H. R. DE. *An improved method of propelling railway or other carriages up inclines.* (A communication.) Dated May 21, 1856. (No. 1197.)

This consists in causing a current of water to impinge against floats or paddles on a wheel, fixed on the same axle as the driving wheels of the carriage to be propelled.

PERRON, J. *Improvements in ornamenting surfaces of wood, ivory, bone, and such like substances.* Dated May 21, 1856. (No. 1200.)

This consists in drilling a great number of holes in surfaces, and inserting pieces of coloured glass therein, disposed in any fanciful manner.

BOWER, M., and J. BARWELL. *A new or improved method of joining the parts of metallic and other bedsteads, and other articles of furniture.* Dated May 21, 1856. (No. 1203.)

The inventors fix upon the upright pillar (say of a metallic bedstead) a block of metal, made with recesses downwards, but not through the block. The recesses receive the ends of the side-rails. The vertical pillar passes through the block, and a second block, without recesses, is dropped over the pillar, and is screwed down tightly (upon a thread on the pillar) against the first block.

MEDLOCK, H. *Improvements in the manufacture of glass, enamels, and other vitrified substances.* Dated May 21, 1856. (No. 1204.)

The inventor uses clay containing from two to ten per cent. of potash or soda, and fuses this with such a proportion of sand and lime, or carbonate of lime, as will nearly produce, with the constituents of the clay, double silicates.

HOLDIN, J., and W. J. DORNING. *Improvements in bouking, bleaching, washing, and cleansing textile fabrics and materials.* (Partly a communication.) Dated May 21, 1856. (No. 1205.)

In apparatus upon the general principle of the dash wheel, the rotary case or wheel is perforated round the circumference, and surrounded by a stationary case, and between the two steam enters, passes through the perforations, and mixes with the goods in the wheel. Scoops, attached to the wheel, scoop up the fluid ingredients from the bottom of the case, and pass them into the wheel again through the perforations.

SCHWABE, R. H. *Improvements in the manufacture or production of ornamental fabrics.* Dated May 21, 1856. (No. 1208.)

In weaving fabrics for fringed flounced dresses, an additional warp beam is fitted up by the side of the ordinary body fabric warp beam, for the formation of the fringes.

GREENLEES, E. *Improvements in the treatment, and preparation or manufacture of textile and pulpy materials.* Dated May 21, 1856. (No. 1210.)

The materials are steeped in a solution of calcined barytes, either in the state of carbonates or sulphates, strontium, or calcium, and are found to be heavier, whiter, and more valuable than unheated substances.

NEWTON, W. E. *Improvements in machinery for spinning or twisting fibrous substances.* (A communication.) Dated May 21, 1856. (No. 1214.)

This consists in the application to all kinds of spinning machinery of what the inventor calls a whistle, which is somewhat similar to the tube employed in machinery for spinning cotton, and to that used in carding engines for carding wools. The tube is mounted between the drawing rollers and front roller, so that it can neither rise nor fall.

ASTON, W. H., and S. HOPKINSON. *Improvements in steam-boiler furnaces and apparatus employed for supplying water to steam-boilers.* Dated May 21, 1856. (No. 1215.)

This invention consists of an arrangement of furnace, &c., with two sets of hollow fire bars employed for heating the feed water, &c.

CURTIS, W. J. *Improvements in the ma-*

nufacture of iron railway wheels. Dated May 21, 1856. (No. 1216.)

The iron for the spokes is at intervals rolled with inclined projecting edges, to form that part of each pair of spokes which produces the curve between the two, and by the conjoined series of spokes the ring or felloe on which the tyre is fixed. The tyre is formed with a projecting inner rib, with a groove for receiving one of the inclined projecting edges of the ring of the wheel; and the tyre is also formed with a projecting portion on one side, to be bent over the other projecting inclined edge of the ring or felloe of the wheel.

GEDGE, J. *An improved gridiron.* (A communication.) Dated May 23, 1856. (No. 1231.)

On a framing on legs the inventor places moveable grates fixed into catches. Below are ashpans, and a transversal spit, provided with hooks, passes from one support to the other, and a trough is placed to receive the fat or gravy.

GEDGE, J. *Improvements in looms.* (A communication.) Dated May 23, 1856. (No. 1232.)

"I propose," says the applicant, "to substitute the 'flier' motion for that of the spindle."

GEDGE, J. *Improvements in machinery or apparatus for winding threads.* (A communication.) Dated May 23, 1856. (No. 1233.)

The applicant describes an arrangement of parts for winding threads on cylinders supported by uprights carried by a hexagonal piece of wood resting on three supports, &c.

GEDGE, J. *Improvements in obtaining a material used in dyeing.* (A communication.) Dated May 23, 1856. (No. 1234.)

This consists in the manufacture of "alumish sulphate" by submitting the properly-selected argil to the action of sulphuric acid.

PROVISIONAL PROTECTIONS.

Dated November 21, 1856.

2762. William Jacobs, of Albert-road, Globe-fields, Mile-end. An improved composition for bedding and rendering bricks in furnaces.

Dated December 8, 1856.

2903. Charles John Lewsey and George Nasmyth, of Bucklersbury, City, civil engineers. Improvements in the treatment and application of woods used in the construction of casks and such like vessels, and for other purposes.

Dated January 6, 1857.

51. Charles Emilus Wright, of Green-street, Blackfriars. Improvements in preparing lubricating compounds.

Dated January 8, 1857.

63. George Pate Cooper, of Walworth, Surrey, Improvements in the manufacture of shirt collars.

65. Rupert Newton, of Birmingham, commercial traveller. A new or improved manufacture of metallic boxes.

66. Wright Prestwich, of Oldham, Lancaster, dentist. Improvements in gas burners.

67. Edward Joseph Hughes, of Manchester. Improvements in the manufacture and application of compounds resembling gutta percha and caoutchouc, from flour, fibrine, gelatine, and other vegetable and animal substances. A communication.

68. James Harris, of Hanwell, Middlesex, engineer. An improved lock and method of acting upon lock-bolts, latches, taps and valves, railway and other signals, bells, and other like apparatuses.

69. Alexander McDonald, of Aberdeen. Improvements in the manufacture of columns, pilasters, and other similar structures of granite, marble, porphyry, jasper, serpentine, sienite, and other stones capable of receiving a high polish.

70. Thomas Lawes, of Chancery-lane. A machine or apparatus to be used in cleansing, purifying, and drying animal and vegetable substances.

71. Thomas Ball and John Wilkins, both of Nottingham, manufacturers. Improvements in manufacturing looped fabrics, suitable for the making of gloves and other articles.

72. John James Russell, of Wednesbury, and Joseph Bennett Howell, of Sheffield. Improvements in the manufacture of steel tubes, applicable to the flues of steam boilers and other uses.

73. Thomas William Keates, of Chatham-place, City, chemist. Improvements in the treatment of Rangoon naphtha, and other varieties of petroleum.

74. John Roberts, of Upnor, Kent, terra cotta manufacturer. Improvements in the stoppering or closing of jars, bottles, and other vessels, applicable also to the joining of earthenware and other pipes.

75. Robert Turnbull, of Harwich, Essex, foreman shipwright. Improvements in cradles for heaving up ships.

Dated January 9, 1857.

76. John Rock Day, of Birmingham, machinist, and Joseph Lester Hinks, of Birmingham, manufacturer. Improvements in constructing and attaching knobs and handles of drawers and doors, cupboard turns, and other such like articles.

77. John Henry Johnson, of Lincoln's-inn-fields. Improvements in machinery or apparatus for sewing or uniting and ornamenting fabrics. A communication from P. Chevolot, and J. F. Ligney.

78. Robert Smith, of Longridge, near Preston, manufacturer. Certain improvements in the manufacture of corded skirtings and corded petticoats.

79. John Henry Johnson, of Lincoln's-inn-fields. Improvements in the application of the electro-type or galvano plastic processes. A communication from E. Lenoir.

80. John Anderton Carruthers, of Over Darwen, near Blackburn, Lancaster, reed maker. Improvements in the mode or method of forming the lease or shed in sizing, warping, or weaving.

81. James Hardacre, of Manchester, machinist. Improvements in machinery or apparatus for preparing cotton, wool, and other fibrous substances to be spun.

82. Joseph Gibbs, of Abingdon-street, Westminster, civil engineer. Improvements in extracting gold and silver from their matrices and from other substances or materials with which they are combined, mixed, or associated.

Dated January 10, 1857.

84. John and Christopher Gratrix, of Preston, machine makers. Improvements in looms.

85. Louis Julien Brethon, of Tours, France, practical engineer. Improvements in machinery for manufacturing draining pipes, bricks, tiles, and all other similar plastic articles.

86. David Dunne Kyle, of Albany-street, Regent's-park. A method of retarding or stopping railway trains and carriages, applicable also to carriages on common roads.

87. John Adams, of Ivy-cottages, Queen's road, Dalston, London. A Minié or other rifle-sight on a new and improved plan.

88. John Chauter, of Bow-road, and John Wakefield, of Suchicore, Dublin, engineer. Improvements in the fire-boxes or furnaces of locomotive engine boilers.

89. James Hodgson, of Sweeting-street, Liverpool. An improvement in constructing wrought-iron masts, yards, bowsprits, and other ships' spars.

90. Francis Xavier Kukla, of Raven-row, Mile-end-gate. Improvements in apparatus for heating stoves by gas.

91. Charles Richard Olliffe, of Park-lane, Hyde-park, and James Anning Gollop, of New Oxford-street. Improved apparatus for cleaning knives.

93. Paul Desrues, of Paris, chemist. Improvements in purifying gas.

94. William Watt, of Belfast. Improvements in treating or preparing Indian corn and other grain and amylaceous vegetable substances for fermentation and distillation.

95. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in galvanic batteries and in apparatus connected therewith. A communication from Messrs. Grenet, jun., and de Fonvielle.

96. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in propelling ships, boats, and other vessels. A communication from F. Jeandeau.

Dated January 12, 1857.

97. Benjamin Biram, of Rotherham, gentleman. Improvements in machines for washing coal and other minerals.

99. Arnold Goodwin, of Guildford-street, London, engineer. An improvement in fixing the tubular flues of steam boilers.

101. Uriah Scott, of Camden-town, civil engineer, and Frederic Holdway, of Bayswater. Improvements in the manufacture of metal type, and the arrangement of the same for various purposes.

103. Richard Chrimes, of Rotherham, brass founder. Improvements in apparatus for regulating the pressure of fluids.

Dated January 13, 1857.

105. John Hinks and George Wells, of Birmingham, manufacturers. An improvement or improvements in metallic pens.

107. William Gossage, of Widnes, Lancaster, chemist. Improvements in the manufacture of sulphuric acid and in the construction of apparatus used for such manufacture.

109. Michael Potter, of Manchester, gentleman. The application of certain materials in the manufacture of healds for weaving.

111. François Auguste Verdeil, of Paris, and Emond Michel, of Quai Impérial Puteaux, départ. of the Seine. Improvements in obtaining extracts from madder for dyeing and printing.

113. Robert Russell, of the firm of Fowkes and Russell, of Derby, ironfounders. Improvements in stoves and fire-places.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January 27th,* 1857.)

2179. C. H. Schröder. An improved rotatory engine, to be worked by steam or other elastic fluid, which invention is also applicable as a rotatory pump for raising and forcing liquids.

2182. J. M. Hetherington and I. Gee. Improvements in flyers for preparing cotton and other fibrous substances for spinning.

2183. I. Baggs. Improvements in smelting or reducing copper and other metals from their ores, and in the manufacture of sulphuric acid in or by such processes.

2189. R. Wilson. Improvements in the construction of fire-proof floors and ceilings, applicable in part to the construction of bridges and other structures.

2190. W. F. Plummer. An improved mode of preparing hard wheat and other hard grain for grinding.

2193. C. Goodyear, jun. Improvements in the manufacture of pen-holders, and handles for pen-holders.

2194. J. B. H. de Roussen. Certain improved apparatus for washing and cleansing ores.

2196. C. F. Vasserot. Improvements in filtering water on a large scale. A communication.

2204. G. Dawes. Improvements in the manufacture of hats.

2211. The Hon. W. E. Cochrane. An apparatus for converting crude iron while in a fluid state from a blast, or other furnace, into malleable or bar iron and steel.

2213. T. W. Rammell. Improvements in constructing railways and propelling carriages thereon.

2216. G. W. Sayer. Improved machinery for stopping or retarding railway carriages. A communication.

2227. F. Wrigley. An improved friction coupling for the transmission of motive power.

2232. A. G. Baylis and J. Green. An improvement or improvements in the manufacture of needles.

2239. W. Beatson. Improvements in puddling iron.

2242. R. Brown. Improvements in taps or valves.

2280. J. Lord. Certain improvements in the process of separating or recovering animal wool or silk from cotton and woollen or from cotton and silk or other mixed fabrics, whereby the animal wool or silk is rendered capable of being again employed, which said improvements are also applicable to wool in its unmanufactured state.

2288. W. G. Gard. Improvements in bits for boring and sinking.

2315. P. A. L. de Fontainemoreau. Improvements in the construction of roofs of buildings, which improvements are applicable to the construction of arches of bridges. A communication.

2340. O. W. Barratt. Improvements in the dyeing or staining, and ornamenting of articles of pearl, bone, and vegetable ivory.

2388. A. V. Newton. A new gaseous liquid to be used in generating motive power. A communication.

2394. W. and J. Todd. Certain improvements in power looms for weaving.

2483. C. W. Harrison. Improvements in the insulation and protection of electric conductors.

2524. W. Brodie. Improvements in the manufacture or production of roofing tiles.

2582. W. K. Westly. An improved method of, and machinery for, heckling, combing, drawing, and preparing fibrous substances for spinning.

2701. H. H. Fox. Improvements in manufacturing brushes.

2751. R. A Brooman. A method of, and certain varnishes or compositions for, rendering wood and other substances uninflammable and fireproof, applicable also to the indurating of calcareous earths and stone, and to the rendering of paper and fabrics damp-proof, together with apparatuses for manufacturing such compositions. A communication.

2761. W. E. Newton. Improvements in machinery for spinning or twisting fibrous substances. A communication.

2790. G. Sharp and W. Elder. Improvements in steam hammers and machinery for forging iron and other substances.

2810. W. Woofe. An implement for paring land, applicable also to the removing of turf.

2814. P. Walker. Improvements in brewing, and in the machinery or apparatus employed therein.

2976. C. F. Vasserot. Preserving salmon trout and other fish. A communication.

3051. B. Goodfellow. Improvements in the construction of steam boilers.

3091. W. A. Gilbee. Improvements in treating beetroot for the manufacture of vinegar. A communication.

3. W. Rigby. Improvements in machinery or apparatus for engraving metallic cylinders or rollers employed for printing calico and other substances.

15. J. House. Improvements in concentrating and preserving milk and other liquid articles of food.

33. C. Binks. Improvements in treating ore in the manufacture of iron, and in obtaining products therefrom.

34. C. Binks. Improvements in obtaining certain compounds of cyanogen.

36. J. Ingham, E. Ingham, and B. Ingham. Improvements in apparatus employed in finishing textile fabrics.

40. D. Baker. An improvement in the manufacture of paper.

53. A. A. Dunbar. Improvements in lifting, lowering, and disengaging ships' boats.

72. Sir J J. Russell and J. B. Howell. Improvements in the manufacture of steel tubes applicable to the flues of steam boilers and other uses.

75. R. Turnbull. Improvements in cradles for heaving up ships.

78. R. Smith. Certain improvements in the manufacture of corded skirtings and corded petticoats.

103. R. Chrimes. Improvements in apparatus for regulating the pressure of fluids.

107. W. Gossage. Improvements in the manufacture of sulphuric acid, and in the construction of apparatus used for such manufacture.

111. F. A. Verdeil and E. Michel. Improvements in obtaining extracts from madder for dyeing and printing.

180. T. Kitelee. An improved combination of ingredients to be employed as a breakfast powder or article of diet.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1854.

142. Robert Angus Smith and Alexander McDougall.
150. Cyprien Marie Tessié du Motay.
153. Peter Spence.
162. John Lochart, jun.
183. John Bird.
190. Archibald Lockhart Reid.
193. Thomas Wicksteed.
194. Thomas Wicksteed.
226. Richard Garrett.
243. Richard Archibald Brooman.

1856.

251. Alfred Vincent Newton.

LIST OF SEALED PATENTS.

Sealed January 23, 1857.

1741. Ferdinand Potts.
1742. John Onions.
1748. Henry Doubleday.
1754. James Ashman.
1758. George Collier, John Crossley, and James William Crossley.
1770. Thomas Wrigley.
1772. Samuel Jay and George Smith.
1776. Julien Denis.
1778. Charles Hodges.
1783. Henry Remington.
1857. William Hall, Elisha Wylde, and William Waite.
1884. Peter Armand Lecomte de Fontainemoreau.
1896. Wiliam Church and Henry Whiting Hamlyn.
1920. Philippe Pierre Hoffmann.
2482. George Chappell Potts.
2758. Charles Tooth.

Sealed January 27, 1857.

1786. Henry Robinson.
1787. Edmund Eaborn and Matthew Robinson.
1791. William Griffin and Elizabeth Duley.
1819. John Watkins Brett.
1823. Eugene Perré Chevallier.
1839. Josiah Firth and Joseph Crabtree.
1849. Alfred Vincent Newton.
1867. Joseph Leese, jun.
1871. William Edward Newton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Dec. 23	3923	E. Nevill	Birmingham	Fastener for coffins, &c.
29	3924	T. Pembleton & Sons	Birmingham	Inkstand.
30	3925	G. G. A. L. M. Schelhorn	Birmingham	Metallic pen.
,,	3926	R. Boswell	Islington	Stay-fastener.
1857.				
Jan. 2	3927	Farwig and Bullock	Rupert-street	Lanthorn.
6	3928	W. G. Shaw	Kingsland	Signalizer.
7	3929	H. Bamford	Uttoxeter	Stove and guard.
15	3930	W. Rawlings	Gloucester	Fastening.
16	3931	E. Howes	Birmingham	Lamp-door fastener.
17	3932	J. Mansfield	Harleythorn, Staffordshire	Chaff-cutting machine.
,,	3933	Palmer and Sons	Birmingham	Screw-wrench.
02	3934	M. R. Ashwin	Birmingham	Iron boot-heel.
12	3935	T. Todd	Edinburgh	Stay-fastener.

Jan. 21	3936	W. Aston	Birmingham	Buckle.
,,	3937	Dent, Alcroft, & Co.	Wood-street	United service collar.
23	3938	C. Rowley and Co.	Manchester	Buckle.
24	3939	A. N. Dare	Piccadilly	Turnover collar.

PROVISIONAL REGISTRATIONS.

Dec. 26	831	T. Bullock	Holloway	Closet-valve.
31	832	J. Barlow	King William-street	Coffee-roaster.
1857.				
Jan. 5	833	J. Merson	Kingsland-road	Manumotive traveller.
,,	834	P. F. Leburn	Tooley-street	Anti-garotte glove.
8	835	Moran and Quin	Poland-street	Stereoscope.
9	836	J. Parkes	Birmingham	Life-protector.
,,	837	S. Norris	Horseferry-road	Smoking-pipe.
20	838	M. A. Soul and W. Davison	Princes-street, Finsbury	L-slotted candle-lamp.
23	839	C. Rowley and Co.	Birmingham	Belt-clasp.
23	840	T. Patstons	Birmingham	Gas-shade.
,,	841	T. Radcliffe	Hammersmith	Rule pencil.
28	842	T. Howard	Leamington	Stove.

NOTICES TO CORRESPONDENTS.

The publication of several articles and numerous letters is unavoidably deferred.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine*, must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

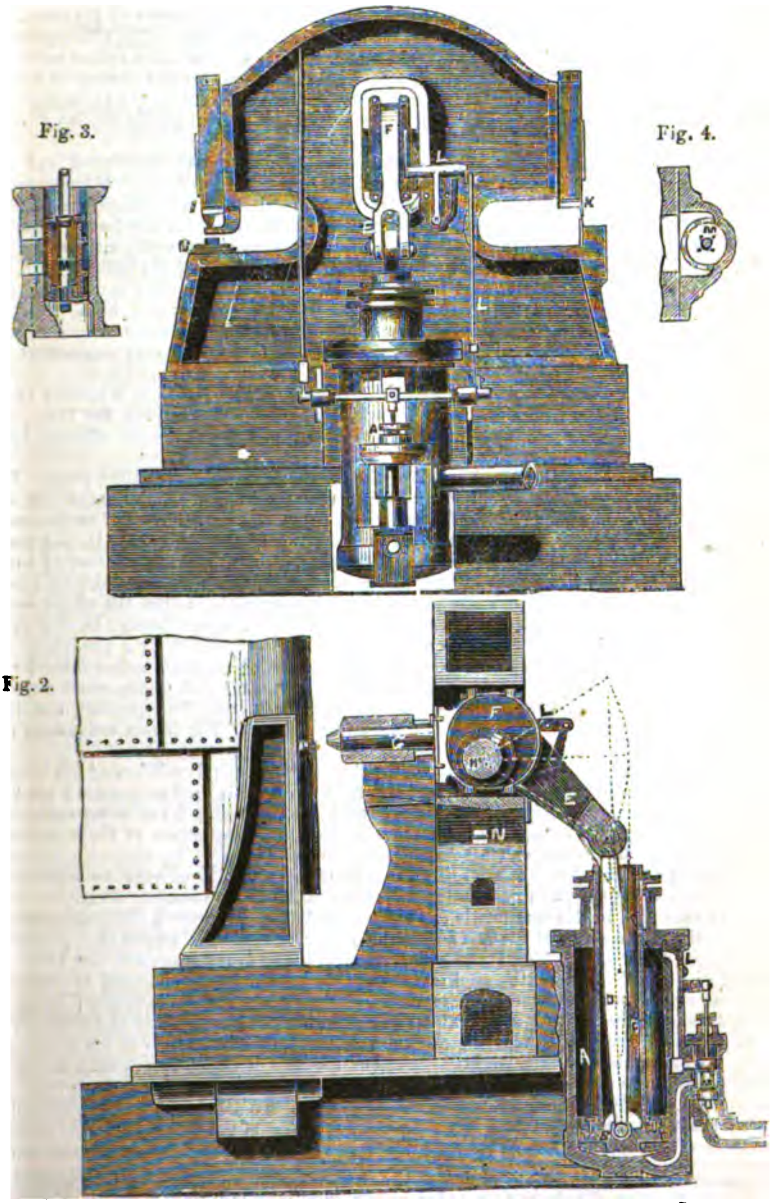
Mechanics' Magazine.

No. 1748.] SATURDAY, FEBRUARY 7, 1857. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

HARVEY AND WHITELAW'S STEAM RIVETING, PUNCHING, AND SHEARING MACHINE.

Fig. 1.



HARVEY AND WHITELAW'S STEAM RIVETING, PUNCHING, AND SHEARING MACHINE.

BY MR. ROBERT HARVEY, OF GLASGOW.*

In the manufacture of steam boilers, the operation of riveting is mostly effected by hand labour, and in order to bring the heads of the rivets to a proper form and finish, much of the hammering takes place when the rivet has approached to a nearly cold state, the tendency of which is to destroy to a certain extent the fibrous character of the rivet. The case of a rivet head starting off under the operation of proving the boiler, although seldom occurring, has revealed the fact that a crystalline character must be more or less assumed by the iron in all rivets worked in the usual manner; and hence, besides aiming at economy by the use of steam for riveting, it is very desirable that the rivets should be finished in as short a time as possible, and without that succession of blows by which the fibrous character of iron is always more or less injured.

Steam riveting-machines are not a recent invention; they have been tried and abandoned in some cases, from their complexity and liability to derangement. Other machines, in which a cam moved through a fixed distance, acting through a combination of levers, having always a fixed distance for the travel of the riveting die, have lost favour from being unable to adapt themselves to irregularities in the lengths of rivets, which must of necessity occur at the junction of plates, where "three plies" are used, and in the general work, when the rivets are not absolutely correct in length. In other steam riveting machines that are called direct-acting, which have deservedly been well received, a very high pressure of steam, 50 lbs. per square inch, is used, requiring in most cases a separate boiler for the machine, or a greatly-increased size of steam cylinder, and consequent augmentation of price.

In the machine now described, the joint invention of the late Mr. Whitelaw and the author, and manufactured under the author's immediate superintendence, the three essential processes of boiler-making—punching, shearing, and riveting—are effected by one steam cylinder, and in one frame.

The machine is shown in figs. 1 and 2 of the engravings on the preceding page. Fig. 1 is an end elevation of the machine, and fig. 2 a longitudinal section through the steam cylinder. The steam cylinder, A, is 15 inches diameter, and has a stroke of 24 inches; the piston, B, has a trunk, C, attached to it, by means of which the piston rod, D, has room to accommodate itself to the travel of the radiating lever, E, to which it is attached by a strong pin joint. This lever has an eye, F, forming an eccentric, to which the slide, G, carrying the riveting die is attached by a strap of considerable breadth, so that the whole working pressure may be distributed over a surface of great extent; consequently, in the present machine, after nearly twelve months' constant work, no perceptible wear is exhibited. The wrought-iron shaft, H, upon which the lever is securely keyed, is 6½ inches diameter, and works in long and truly-bored bearings in the frame. One end of the shaft works the punching slider, I, by a pin turned eccentrically so as to give the necessary travel; the other end works the shearing slider, K, in a similar manner. The shears and punch travel 1¾ inch, and the riveting die about 3 inches.

It has not been thought advisable to render the machine entirely self-acting; it is started and stopped by hand for every stroke performed. The steam is used only during the "up" or effective stroke, the weight of the piston, trunk, and radiating lever being sufficient to bring the piston to the bottom of the cylinder. Between the bottom of the cylinder and the piston, a portion of the exhaust steam is retained as a cushion, by which the piston and all the parts connected with it are softly brought to rest; this is effected by a self-acting arrangement of levers, L, in connection with the eye, F, of the radiating lever.

The steam used in this machine is not more than 20 lbs. per square inch pressure; but through the intervention of the lever arm the power is sufficient to punch a ¾-inch hole through a ⅝-inch plate. The steam valve, M, figs. 3 and 4, is an equilibrium valve, consisting of a double piston with metallic packing, the steam being admitted to press upon each end of the valve, and the discharged steam passing out round the centre; being perfectly balanced, this valve is moved at each stroke with the greatest ease and accuracy.

In punching, the plate is moved along the bolster, N, till the mark is in the proper position; the steam valve is then slightly lifted, and the hole is instantly punched with a very small expenditure of steam. The steam is shut off the moment the punch is seen to strike the plate, a sufficient quantity of steam having been by that time admitted to complete the work; the resistance of punching the hole and the weight of the piston and lever overcome the force of the steam when about two-thirds of the stroke has been performed, and the

* The above article formed one of the papers read at the Glasgow Meeting of the Institution of Mechanical Engineers. The machine described is a very excellent one, and will be received with favour by boiler manufacturers and others.

piston then returns to the bottom of the cylinder, ready for the next stroke, the time for which is seen by the man in charge of the machine, and the stroke is effected at the instant required. A great economy of time arises from the circumstance that the punch is not limited to a fixed number of strokes per minute, but can be worked at any rate that may be required to suit accidental variations in the work. The time in which work can be done is limited only by the men working the machine. Thirty $\frac{11}{16}$-inch holes can be punched in a $\frac{7}{16}$-inch plate in one minute, and in riveting eight to ten rivets can be put in in the same time.

A decided advantage is obtained in this machine by the eccentric motion employed to move the riveting ram; for as the full side of the eccentric approaches its extreme point in the centre of the ram, a continually-increasing power is obtained, the greatest power being in action when the rivet is being finished, and the plates by this means are drawn into the closest contact.

The boiler work to be riveted is suspended in the position shown in fig. 1, from a strong frame of simple construction, carried by two upright standards, which rest upon knuckle joints at the bottom; the standards are capable of complete adjustment by means of two horizontal beams, having their ends attached near to the top of the standards, and passing through a wall, with racks upon their other ends gearing into pinions; by turning these pinions the top of the frame carrying the work is adjusted, and brought into the required position with respect to the stationary die.

In the discussion which followed the reading of the paper, the Chairman (Mr. Joseph Whitworth) inquired how many of the machines were at work.

Mr. Harvey replied that only one machine of the kind had yet been constructed, which was at Mr. Cook's works in Glasgow, where it had been working satisfactorily for nearly twelve months, and had been found a very useful and advantageous tool.

Mr. Fairbairn considered the machine presented a beautiful and excellent combination of the two principles on which the success of steam riveting depended—a variable length of stroke of the riveting die, and sufficient rapidity of execution to complete the rivet while hot; and the addition of the punching and shearing apparatus made it a very complete tool.

Mr. Harvey observed that a pressure of five tons had been mentioned as necessary to form the rivet head; but in the present machine 30 tons pressure was obtained at the end of the stroke, in consequence of the proportion of the lever and eccentric, the advance of the die at the end of the stroke being at only one third of the rate at the commencement. As the result of this heavy pressure, a considerable difference was found in the rivets put in by this machine compared with those put in by ordinary direct-acting steam riveting machines, the heads in the latter case being round and open at the edge, whilst those made by the present machine were quite close and finished all round, in consequence of the great nip given by the die in finishing the rivet. The rapidity of the work with this machine was so great that three rivets put in by it would remain still red at once.

Mr. Fothergill observed that the conical form of head in hand riveting, arising from the mode of striking with the hammers, was inferior in strength and substance to the round-headed machine rivet.

Mr. Ramsbottom asked what means were adopted to prevent the plunger striking the end of the cylinder in the new machine, when the resistance was suddenly removed in punching a plate.

Mr. Harvey replied that the machine was regulated by hand without difficulty; as soon as the man saw the punch strike the plate, he then suddenly shut off the steam, enough having been by that time admitted to complete the punching of the hole; the power of the steam was thus spent, and the lever returned immediately to its original position ready for the next stroke. A wood block was at first fixed on the frame as a buffer to stop the lever before the plunger reached the top of the cylinder; but this was not now found necessary, as the steam was allowed to escape by a side passage into the exhaust pipe, before a blow on the frame could take place.

COMPRESSED AIR-ENGINE AT GOVAN COLLIERY.

BY W. C. RANDOLPH, OF GLASGOW.*

This engine was designed for a special purpose in the working of the Govan Colliery, near Glasgow, where an ordinary engine was not applicable; and although under other circumstances not an economical mode of employing power, it has proved in the present case highly satisfactory, and has worked successfully for several years.

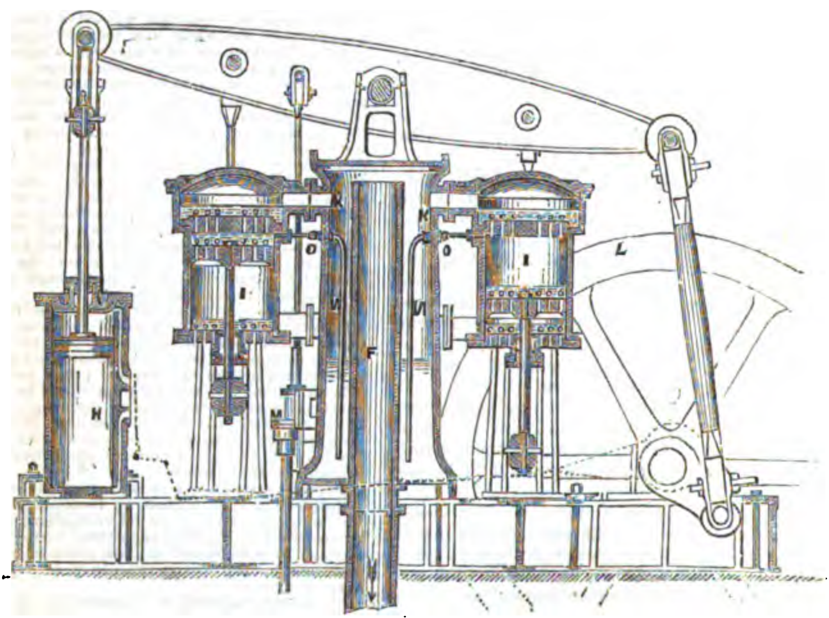
The main shaft is sunk 176 yards deep, through six successive seams of coal, the first of which is 92 yards from the surface at that point; and after working the coal at that part, a main road was driven horizontally to a distance of 706 yards, intersecting the coal seams, which dip at an inclination of about 1 in 11, as shown in the drawing. A second shaft, at present 26 yards deep, was then sunk near the extremity of the main road, for the purpose of working the third seam, or "rough main" coal. The difficulty then arose of providing for the winding and pumping of this second shaft at a distance of nearly half a mile from the first shaft. A steam boiler was inadmissible in that situation, and the distance was too great to convey steam from the surface. Some application of water power was contemplated by the manager, Mr. James Allan, who applied to the author for the purpose of

* A paper read at the Glasgow Meeting of the Institution of Mechanical Engineers.

carrying it out; and it was then proposed by the author, upon the original idea suggested by Mr. David Elder, to make use of compressed air supplied by a compressing steam engine at the surface, and conveyed down by a pipe to work an engine at the top of the second shaft, in the manner of a non-condensing steam engine, the discharged air being thrown into the workings to aid in the ventilation of the mine. This proposal was adopted, and the present engine was designed and constructed for the purpose by Messrs. Randolph, Elliot, and Co.; it has now been working at the colliery more than six years, and has been found to answer the purpose completely.

The main shaft contains a single winding apparatus, and a set of four pumps, and forms the downcast shaft for the ventilation; it is 18 feet long and 8 feet wide, being oval at the top and rectangular below. It opens at the bottom to the horizontal main road, which is 9 feet wide and 6 feet high, divided by a brattice in the centre throughout the whole length, for the downcast and upcast currents. The upcast shaft, 7 feet diameter, has a ventilating furnace at the bottom, and contains a single winding apparatus. In a recess at the top of the second shaft is fixed the air engine for working the winding and pumping apparatus of the second shaft. The compressed air is conveyed to it by a cast-iron pipe, 10 inches diameter inside, carried down the main shaft, from a steam engine at the surface, which is employed to compress the air.

The compressing engine is shown, in vertical section, in the accompanying engraving. The steam cylinder, H, is 15 inches diameter, with a stroke of 3 feet, and drives two condensing air pumps, I I, which work alternately one on each side of the beam centre, delivering the air into the centre reservoir, K, from which it passes into the main pipe, F. The beam is connected at the other end to a crank and fly-wheel, L, to equalize the motion. The air pumps, I I, are 21 inches diameter, with a stroke of



18 inches; they are placed inverted, with the piston rods passing out below, where the stuffing boxes are not exposed to the pressure of the compressed air, and are worked with crossheads sliding in vertical guides by means of side rods from the beam. The air

pumps are fitted with ball valves, of which there are three sets to each pump, each set consisting of 44 brass balls, 2 inches diameter, arranged in three concentric rings. The balls are confined by separate cages to a lift of half an inch. In consequence of the high pressure of the air, amounting to 30 lbs. per square inch, provision is made for preventing leakage through the valves, by a stratum of water constantly covering the piston valves and the delivery and inlet valves, through which all the air has to pass. A small pump, M, 3 inches diameter and 10 inches stroke, is employed to supply water for this purpose, and delivers it into the centre reservoir, K, from which it flows through the small pipes, N, into each of the air pumps, during the period of their downward strokes, the quantity of water admitted being regulated by a cock, O, in each pipe. The surplus water is discharged at each upward stroke through the delivery valves, and flows over the top into the centre reservoir, K, keeping the delivery valves also covered with water; in this way the compressed air is entirely discharged, and there is no loss of power from expansion of air behind the piston at the beginning of the downward stroke. The level of water in the centre reservoir is regulated by means of a gauge glass at the side. Any leakage of water past the piston valves and piston escapes through the suction or inlet valves, and is carried off by a waste pipe fitted to the casing of the air pumps.

The air pump barrels are lined with brass to prevent corrosion, and the pistons are faced with brass, and without packing, being merely turned a good fit to the cylinders. The pumps have continued working the whole time since starting, a period of more than six years, working part of the time day and night, without requiring any repairs or adjustment; nothing has been done to them except replacing some of the valve cages which had been broken.

The usual speed of this engine is about 25 revolutions per minute, with a pressure of steam of 18 lbs. per square inch, giving a pressure of air averaging about 20 lbs. per square inch.

The air engine at the lower shaft has a cylinder 10 inches diameter and 18 inches stroke, and works usually at about 25 revolutions per minute; it is an old steam engine, and was formerly worked with high pressure steam. It was intended to be worked with air at 30 lbs. per square inch pressure, and at that pressure the heat generated in compression was expected to be very great; indeed, calculation at the time gave nearly the melting point of tin. The great safety valve, however, for getting rid of the heat developed is, as was anticipated, the water upon the valves of the compressing engine, which absorbs the heat as soon as generated, a portion of the water passing off through the main pipe in the form of steam; this steam becomes condensed in the pipe, and provision is made for drawing off the water of condensation from time to time as it accumulates at the bottom of the shaft by means of a cock.

The pressure of the air at the lower engine is only about 1 lb. per square inch below the pressure at the compressing engine at the top of the pit. The absorption of heat on the sudden liberation of the compressed air from the lower engine at the discharge of each stroke causes so great a degree of cold that in winter the engine is often stopped by the formation of ice in the cylinder and exhaust pipe.

Mr. Randolph, in the discussion which followed the reading of the paper, observed that the temperature of the air in the main column varied from 90 deg. to 140 deg. Fahr., depending on the velocity of the working of the engine and the state of the atmosphere; and if it had not been for the use of the water, the engine would have been a failure in attempting to compress the air to 30 lbs. pressure per square inch, as the calculated temperature resulting from that amount of compression would be somewhere near the melting point of tin. The three sets of valves were adopted to ensure the greatest action from the pumps.

The present case afforded opportunities of experimenting on various scientific questions, which might be well worth following out. The state of the thermometer at both the compressing and working engines under all the variations of pressure below the maximum might be noted: indicator diagrams might be taken from the compressing air pumps, and the compression curve would then show the whole time of the delivery of the compressed air, and would indicate the rise of temperature, which should be the greatest source of loss in this mode of applying power: the friction in the transmission of the air through pipes might also be correctly ascertained.

Mr. Rogers considered there might be many other situations where such a mode of conveying power would prove advantageous. He thought the temperature of the discharged air must at all times be lower than the freezing point; and the cold air issuing into the workings would be very beneficial in cooling the mine, as the temperature of the coal itself was as high as 80 degs. Fahr. in deep pits, and the air was often heated by the men and horses to 90 degs. or more, causing serious inconvenience to the miners.

Professor Rankine remarked that the same principle had been applied by Professor Piazzi Smyth to the cooling of air for ventilation; compressed air was passed through tubes surrounded by water, so as to abstract the heat produced by the compression, and by being allowed to expand again was cooled.

Mr. Rogers had tried the experiments on this subject with Professor Warrington W. Smith, and they had found that air at a pressure of about 10 lbs. per square inch was cooled down to 37 degs. Fahr. temperature on expanding suddenly, which was quite in accordance with theory.

Professor Rankine believed the first production of ice by the expansion of compressed air was effected by Dr. Gorrie in Florida, independently of the invention of the process for cooling air in this country.

Mr. Fothergill remembered seeing an ice-making machine upon that principle in London about fourteen years ago.

Mr. Harvey was surprised to find only 1 lb. or 2 lbs. loss of pressure in the air at the end of so great a length of pipe; but an important advantage was obtained in this respect, but having the air main equal in area to the working cylinder, as in the present case. It was certainly more economical to carry compressed air down into the mine than high pressure steam, as there would be a serious loss of power in conveying steam to so great a distance as half a mile. He had seen a pit in Fifeshire where steam was conveyed down from a boiler at the surface to work an engine under ground, but a very high pressure was required at the top to give a sufficient working pressure at the bottom.

Mr. Fairbairn thought it would be very desirable to experiment upon the difference of temperature and pressure with both steam and air in descending a shaft, and hoped the subject might be taken up by Professor Rankine, as a good opportunity was afforded in the present instance for the trial of air. In the case of a powder mill at Constantinople that he remembered, compressed air was conveyed a distance of 300 yards to drive the machinery, but a great loss of power and pressure was experienced, from the friction in the pipes before reaching the engine.

RANSOME'S PATENT SILICEOUS STONE.

At this period of scientific advancement and research, when every invention of a useful or elegant nature is earnestly investigated, a knowledge of the properties and manufacture of siliceous stone will be of interest to our readers, more especially as architects, builders, and their patrons now readily adopt such materials as will produce a greater amount of ornamentation at a diminished expenditure. The siliceous stone occupies a high position in this category, from the fact of its possessing the essential properties of extreme durability and stone-like appearance, in combination with comparatively small cost in production.

The peculiarity which distinguishes this from other artificial stones, consists in the employment of silica, both as the base and the combining material. The ingredients are used in the following proportions: 10 pints of sand, 1 pint of powdered flint, and 1 pint of alkaline solution of flint, or soluble glass, which are well mixed in a pug mill until the whole mass becomes of a perfectly uniform consistency. The moulds are made of iron, wood, and plaster, separately or in combination. In filling them a short stick is used to ram in the putty-like substance, which retains the forms impressed upon it with great persistency and sharpness. The casts upon being relieved from the mould are "floated" with the silicate, and any defective parts repaired. They are then placed in closed stoves to be dried, and thence taken to the kilns, the temperature of which is gradually raised for the first 24 hours; the intensity is then increased for 48 hours, until a bright red heat is produced. The casts are then allowed to cool for four or five days, at the end of which period the process is completed.

Having thus in general terms described the process, we proceed to give Mr. Ransome's invention for the manufacture of the silicate or solution of flint, the consideration of which it is well worthy. He discovered that by digesting the flints with caustic soda in boilers under steam pressure, the alkali combined with more silica than by any other method. He has accordingly constructed an apparatus, consisting of tanks, for reducing the ordinary soda of commerce to the condition of caustic soda, and also for purifying it from sulphate of soda, and of a digester in which the process of dissolving the flints is effected, consisting of a cylindrical vessel, having therein a wire basket, reaching the whole length thereof, to contain the nodules of flints, which, being suspended in the caustic ley heated by steam, are dissolved, and silicate of soda is formed which passes over into receiving and evaporating vessels. The whole apparatus is closely connected with a boiler, the steam from which is extensively used in every stage of the process.

Mr. Ransome's drying process is very ingenious and successful. Instead of the stone being dried in an open kiln, it is placed in a closed chamber or boiler, surrounded by a steam jacket, by which the temperature of the interior chamber can be regulated. In order that no superficial evaporation shall take place while the stone is being raised to the temperature of the steam in the jacket, a small jet of steam is allowed to flow into the chamber, and condense among, and on the surface of the goods, until, as the temperature of the interior of the stones rises to 212° and upwards, they become enveloped in an atmosphere of steam, which effectually prevents any hardening or drying of *the surface.* The minute vents formed by the steam as it is generated in the interior of the masses remain open when the vapour contained in the closed chamber is allowed slowly to escape, and afford a means of egress to any moisture which may still be retained among the particles of sand and silicate. The whole of the moisture being thus vaporised, is allowed to escape, leaving the interior of the stone perfectly dry before the exterior becomes hardened.

Mr. Ransome's attention was first directed to the subject of artificial stone in 1844, while connected with the establishment of his relatives, the Messrs. Ransome of the Orwell Works, Ipswich, and the new material

has been subjected to tests of our variable climate for several years without any evidence of deterioration, and has received the unqualified approval of many men of science. All kinds of architectural embellishments, garden decorations, monumental memorials, &c., are produced in this beautiful material at prices little exceeding that of natural stones in the rough. The works are at Ipswich, and the London depôt is Whitehall Wharf, Cannon-row, Westminster, at which place an excellent assortment of goods may be inspected.

THE MACHINERY OF THE WAR DEPARTMENT.

A very interesting paper, on the application of machinery in the War Department, was read last week at the Society of Arts, by Mr. J. Anderson, inspector of machinery, Royal Arsenal, Woolwich. The paper was of necessity of an outline form, the limits assigned to it being too narrow to admit of detailed descriptions.

Up to a recent period, by far the greater proportion of the work, in making the munitions of war, was performed by hand labour. In 1842 there were but two steam engines, together equal to 32 horse-power, which gave motion to a few machines for sawing and planing the timber of gun-carriages. The simple statement that there are now 68 steam engines, with a nominal power equal to 1,170 horses, giving motion to 16,540 feet of shafting, 18 steam hammers, 64 hydraulic presses, and 2,773 machines of various descriptions, will afford some notion of the extraordinary effort which has been made to render the several establishments efficient and fitted for any emergency.

Without prejudice, the United States of America, the continent of Europe, and our own country, have been searched for the most superior appliances, and hundreds of machines have been designed for purposes peculiar to the War Department, but which may be usefully employed in the general manufactures of the kingdom.

From these important changes and improvements the greater proportion of war stores can now be produced with unskilled labour, the form, dimensions, quality, and quantity of the produce being mostly dependent on self-acting apparatus, a system of operation which has been more fully developed in the wood and metal manufactures of the War Department than in any private establishment with which Mr. Anderson is acquainted.

To insure perfect success, the details of the small arms machinery are being carried out by an American gentleman, brought over by the Government, who possesses a thorough and practical experience in the working of this system in the United States, and who has the assistance of several of his own countrymen, from the small-arms factories of New England.

The bayonet, from first to last, undergoes seventy-six operations, each of which is definite and simple, and at the conclusion of the last one, the several bayonets are as much alike as the different pieces of money from the Mint, and they present a degree of accuracy which could not be equalled, even at three times the cost, by the tools or apparatus which have hitherto been employed in England.

The American machinery introduced into England by the War Department is so peculiar, that it presents a rich mine of mechanical notions, worthy of being studied by our machine makers. The gun-stock machinery, especially, is a positive addition to the mechanical resources of the nation.

In 1854, an urgent demand was made from the Crimea for wrought iron shells, an article of peculiar shape, not unlike an immense champagne bottle, which it was found impossible to get by contract in sufficient time and quantity to meet the demand. In this emergency, a factory capable of producing 100 of these shells daily was erected; it covers 30,000 square feet, contains 4 steam engines, 7 steam hammers, and upwards of 40 machines of various descriptions, many of them original and specially adapted to this manufacture; and this establishment was in operation within two months from the date of order, and that, too, during the severe winter of 1854-5—a fact which is worthy of being recorded.

A peculiar feature in the application of machinery in the War Department is, the frequent and successful attempt to congregate a number of instruments together, in such a manner that they may act on an article, or series of articles, simultaneously. To select two examples—one machine is mounted with twenty or more circular saws, on different spindles, horizontal, vertical, and at various angles, so arranged that a passage through the whirling group will produce the required shape or form; a number of pieces of timber are fixed to a moving table, and one after another pass through the saws, and are instantly transformed into shape. Again, there are machines in which some twenty or more drills are arranged in the same manner, and placed so as to drill upwards, in order to get rid of the chips; this principle of operation is extensively used for hard-wood morticing purposes, in various ways, and is very expeditious.

The floating factory which was sent out to the Crimea in ten weeks after it was ordered by Lord Panmure, was visited by the chief officers of the French, Sardinian, and Russian services, all of whom expressed their surprise and admiration, declaring that it, together with the railway, gave them a higher opinion of England, her resources, and her settled determination to conquer ultimately, than almost any other transaction connected with the war.

Besides the floating factory, several other plants of machinery were sent out; among the rest a complete saw mill, with suitable steam engine, to Sinope, another to Balaklava, with both circular and frame saws, and other machinery.

Of the miscellaneous services carried out during the war, one of the most important was the erection of a pier at the wharf of the Royal Arsenal, extending out into deep water, by means of which four of the largest class of vessels can lie alongside during all conditions of the tide: and in connection with this pier is the application of hydraulic power to work the cranes. The whole expense, including the steam engine and hydraulic accumulator apparatus, and the cranes, amounting to nearly £33,500, was cleared off in the saving of the time of vessels alone during the first six weeks that it was in operation—an important consideration, although secondary to the far higher advantage which it affords the War Department, in the rapidity with which it can embark war material and stores.

The Armstrong hydraulic apparatus, for working the cranes, is also being adapted as an immense fire-extinguishing engine, with an air vessel to produce the continuous squirt of water. This air vessel is in the form of a cylindrical steam boiler, with hemispherical ends, and is placed vertically. In connection therewith an iron reservoir, 100 feet in diameter, has been placed on a hill in the vicinity, 220 feet above the Arsenal, and is filled through the fire mains by the hydraulic apparatus. In case of fire, the water in the reservoir is always ready; meanwhile the steam engines, equal to 30 horse-power, will go to work on the pumping apparatus as an auxiliary, and the two combined will afford a plentiful supply of water, equal to the requirements of any probable emergency.

There are 69 steam boilers in the War Department, and that everything conducive to safety and economy in fuel should be carefully attended to, a system of reporting has been organized, showing the working history of each boiler, in regard to proof, times of examination, cleaning, and repairs, also the consumption of fuel, the quantity of water evaporated by a pound of coal, and other particulars.

CHENOT'S IMPROVEMENTS IN THE MANUFACTURE OF STEEL.

An improvement in the manufacture of steel, the invention of M. Chenot,* has attracted attention among scientific men in France. It has already been honoured with the great medal of the Paris Exhibition, and is patented in all countries. There are four English patents, all obtained at the same time. (See *Mechanics' Magazine*, vol. lxv., No. 1725, p. 211.) In the vicinity of Paris an establishment is formed, and is now producing considerable quantities of the article, and by the new method it would appear that steel of a superior quality is manufactured from iron ore with much rapidity, and at one-third of the present cost. The invention is now under examination for Austria, and the Swedish Ambassador has suggested the nomination of commissaries. The following particulars have been communicated to the Paris Correspondent of the *Times*:

The system consists in making steel from the ore, and the principal features of the process are these:—The inventor employs, firstly, an electro-sorting machine to separate the crushed ore, and to raise it to its *maximum* standard of pureness and richness—qualities which the steel subsequently retains; secondly, a system of cementation or addition of carbon and other matters *by cold process*, in such a way that this delicate operation can be repeatedly effected in determined and exact proportions, which results in the production of steel as varied in quality as can be desired, capable of being reproduced with certainty, and of identically the same temper and quality. This result is not without its importance to the consumer, as by the simple use of marks and numbers he can be sure of receiving for any given purpose precisely the same quality of steel with which he had been previously supplied. Thirdly, a compression of the ore after its transmutation, and before or after cementation into a sponge. The ore reduced into a sponge was so liable to be affected by heat or humidity, that it could hardly be kept long enough fit for compression; but in consequence of the great reduction in volume of the compressed sponge it is worked with an economy of fifty per cent. in fuel and manual labour in welding, melting, &c., and thus by this second fact the value of compressing the sponge is evident. The inventor appears to have given practical proof of the commercial advantages of his system, and it is added that he sold his steel in some quantity to French manufacturers at prices which more than trebled the cost of production, without seeking the highest relative prices of Swedish steel, and could thus continue to supply steel of superior quality, not standing him in one-third of the price at which he sold it. From repeated trials, it is said that double the wear could be got out of implements manufactured of steel of this compressed sponge, compared with those

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* In an article in the *Times*, this name was erroneously printed Chenol.

made from good steel of Sheffield marks. By the same process steel can be manufactured from Spanish ore, which steel will not cost above £32 per ton, and be superior in quality to that sold in Paris at £100 per ton. In a word, the inventor secures these advantages—the manufacture of steel in ten days instead of forty, the possibility of reproducing the exact quality of steel desired, and the cost price, not to exceed one-third of the present price, relative qualities being borne in mind.

DUNN'S PATENT FOR BLEACHING PALM OIL.

BEFORE THE JUDICIAL COMMITTEE OF THE PRIVY COUNCIL.

Monday, February 2, 1857.

Present.—Lord Justice Knight Bruce, Lord Justice Turner, Mr. Pemberton Leigh, Sir Edward Ryan, Sir John Patteson, and Sir W. H. Maule.

This was an application on the part of Mr. Dunn, for the prolongation of a patent granted to him in March, 1843, for bleaching palm oil, by which it was rendered colourless, and adapted for the manufacture of soap, candles, &c. The process was simple and inexpensive, and consisted in the application of atmospheric air by means of a coil of pipes. It appeared that the patentee had disposed of two-eighths of the patent, and that the purchasers would be entitled to any benefit resulting from the extension. One of them, Mr. Johnson, a large soap manufacturer, deposed that in consequence of the application of the patent in his business, he had realized a considerable profit during several years; whereas Mr. Dunn stated that, although engaged in making experiments from 1833 to 1843, and in attending to the patent since the period when it was granted, yet he had only realized about 1,500*l*.

Mr. Webster appeared for the applicant; the Attorney-General watched the case in behalf of the Crown.

Lord Justice Knight Bruce, in delivering the judgment of their Lordships, said they had no doubt of the meritoriousness and utility of the invention. It was highly probable that Mr. Dunn, from circumstances into which it was not necessary to enter, had not derived that advantage from it which it was desirable and right that he should do. Looking, however, at the profit made by Mr. Johnson under the patent, their Lordships were under the necessity of declining to recommend a prolongation of it.

ON THE FORM OF SHIPS.

To the Editor of the Mechanics' Magazine.

Sir,—A paper from a correspondent signing himself "H. Y. P.," published in Number 1748 of your Magazine, has directed my attention to Mr. Bland's brochure on the "Forms of Ships and Boats." I was anxious to make myself acquainted with the experiments and consequent deductions by reason of which, according to "H. Y. P.," "Mr. Bland deserves the thanks of his country." The perusal of the book, however, has not left upon my mind impressions in harmony with the tenor of the paper to which I allude. I therefore request that you will extend to me your usual courtesy; and permit me, by means of your columns, to place my views also before your readers.

I should be as ready, I think, as most, to accord thanks or any other reward to an inventor who had established a just claim to them; but I cannot consent to join your correspondent in treating as important that which is really insignificant, and as dignified that which is undoubtedly puerile. With no other knowledge of the matter, one would finish the perusal of "H. Y. P.'s" letter with the impression that Mr. Bland had performed a series of experiments which had authorised him to come to some serious conclusions relating to the speed and forms of ships, either at variance with, or in advance of, those principles which are ordinarily received; and yet in the book itself is found only one proposal *pretending* to be an improvement; and this is quoted in the letter, and relates to an increase of breadth, and diminution of draft of water, in line of battle ships; and in the statement of this, your correspondent seriously contradicts himself, and renders himself unintelligible. He says:

"The draught amidships is fixed at such a measurement, as under a bracketed form of bottom * * * * would amount to only two fifths of the beam. The reader perceives that in the latter case the draught of present three deckers would be reduced from 25 feet to about 12 feet!"

He may well close such a sentence with a note of admiration. First, we are informed that two-fifths of the beam should be the draught of water, and are afterwards told that by this arrangement a three decker would draw 12 feet; now, 12 feet are two-fifths of 30 feet; hence, it follows that a three-decker should be 30 feet broad, and draw 12 feet of water! This certainly is a noteworthy improvement; but I must be excused if I hesitate, at least for the present, to acquiesce in the propriety of the

adoption of such dimensions for the first rates of our Navy.

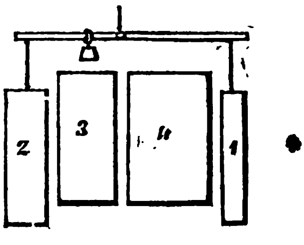
Another false impression which your readers may possibly have derived from the same source is, that Mr. Bland has endeavoured to solve by experiments, accurately and carefully conducted, some of the problems which have hitherto baffled the attempts of the most eminent mathematicians and naval architects. Mr. Bland, however, has confined his attention to testing the relative merits of bluff and sharp bows, as to speed, and of flat and sharp bottoms, as to stability—subjects on which we have knowledge far more extensive, and data far more trustworthy, than any to be obtained from experiments made with models which are certainly small enough, but too rude for toys for the nursery. It would not, of course, be my place to criticise any gentleman who chooses to spend his time in so innocent an amusement as these experiments are doubtless capable of affording; but I object very strongly to the advancement of such absurd pretensions in their regard, and I regret that the ingenuity observable in them was not more productively employed.

In order to justify my strictures, perhaps, Sir, you will allow me to transcribe a specimen or two of the experiments on the character of which I so seriously differ from your correspondent. There is nothing of more importance in a set of scientific experiments than that the first principles which form the substructure of the whole should be free from serious error, because an error in these is often repeated and multiplied to such an extent as utterly to mar the result. To enable your readers to judge the present case from this point of view, I here quote from the first chapter of Mr. Bland's book a passage relating to the resistance experienced by rectangular bodies of various dimensions in their motion through the water in which they float. To investigate this subject Mr. Bland says:

"Four pieces of deal were selected, of the same uniform density and thickness, and each 12 inches long, but varying in width.

No. 1 model 2 inches wide and 12 inches long.
No. 2 ,, 4 ,, ,, ,,
No. 3 ,, 6 ,, ,, ,,
No. 4 ,, 8 ,, ,, ,,

These were two at a time attached to the two ends of a balance rod, of the length of 20½ inches; a third string, acting the part of a fulcrum whilst suspending the rod, was so put on the rod as to admit of being readily slipped along it at the will of the experimenter; the other end being fastened to the small extremity of a long pole, for the purpose of reaching far enough over a pond of water to tow the models upon the surface, clear of all obstacles.
The two models selected for the experiment were then drawn on the water, and whichever of them preponderated, by meeting with greater resistance than the others, had the suspending string shifted along the balance rod until both the floating bodies attained an equilibrium of resistance, when the measure of their respective resistances was denoted by the inverse length of arm or lever to which they



were fastened. The shorter arm was made, in each experiment, to balance correctly the longer arm, by means of a moveable weight applied to the shorter arm.

"Experiment 1.

Models.	Width.	Length.	Weight.
No. 1	2 ins.	12 ins.	10 ozs.
No. 2	4 ins.	12 ins.	10 ozs.

Difference. Weight.
1⅛ inch of lever, or 2 ozs.

"Experiment 2.

Models.	Width.	Length.	Weight
No. 2	4 ins.	12 ins.	12¾ ozs.
No. 3	6 ins.	12 ins.	12¾ ozs.

Difference. Weight.
1⅛ inch of lever, or 2 ozs.

"Experiment 3.

Models.	Width.	Length.	Weight.
No. 3	6 ins.	12 ins.	19 ozs.
No. 4	8 ins.	12 ins.	19 ozs.

Difference. Weight.
1⅛ inch of lever, or 2 ozs.

"In these experiments the dimensions of the models were to each other as 1, 2, 3, and 4; and the head resistance, compared two at a time and of equal weight, gave the same results; consequently the law of the head resistance is, that it increases directly with the increase of the square surface opposed: and therefore, in this instance of equal additions, assumes the arithmetic ratio."

Perhaps, Sir, I ought to apologise for requesting you to occupy your valuable space with such unintelligible stuff as this. My excuse is that it seems to me the only way by which your readers can be enabled to judge of the real merits of a work for which so much has been claimed by "H.Y.P." Such experiments as these three make up the volume. The whole is as meaningless and as worthless as this sample.

All your readers will, no doubt, perceive the extremely misty nature of the above extract, yet it may not be useless to point out a few of its peculiar incongruities. In the first place, the method of conducting the business is quite unadapted for the observation of those minute differences which would be of great importance in such small models. The forces by which the motion is communicated and kept up are not applied in the direction of that motion; for the strings to which the models are attached cannot be held in a horizontal

direction, because it is necessary that the rod should be kept at a distance above the water's surface sufficient for the accompanying weight to move clear of the fluid. And thus applied, they plainly tend to raise the fore parts of the models out of the water, and so to upset their trim and alter the whole character of the experiment. Another difficulty is to understand what is meant by the number of ounces placed in various positions in the tabular experiments. In experiment No. 1 is the force to move the first model through the water at a certain speed 10 ozs., and that for the second model at that speed also 10 ozs.? And yet, in spite of this, is there a difference between these two forces amounting to 2 ozs.? Further, when No. 2 is tried with No. 1, it has a force or weight of 10 ozs.; when tried with No. 3 it has a force or weight of $12\frac{3}{4}$ ozs. associated with it: why is this? Is the model heavier or more sluggish in the second experiment than in the first? Again, is the difference between the lengths of the two arms of the bar $1\frac{1}{8}$th inches in all cases? If so, the forces which balance on this constant lever must have a constant ratio to one another, and so the series of resistances would then be geometrical, not arithmetical, as inferred by Mr. Bland.

With regard to the stability of floating bodies, this volume furnishes a few very strange propositions, which however are as false as they are novel. Take this:—There are two floating bodies of similar and equal rectangular sections with the length of one double that of the other; Mr. Bland asserts that when inclined from like positions of equilibrium through equal angles, the stability of the longer is *treble* that of the shorter. The simplest hydrostatical considerations assure us of the error of such a statement. Indeed it does not require even a knowledge of the first principles of hydrostatics to enable a person endowed with a little common sense to see the falsehood of this principle. It can be seen at first sight that if two floating bodies, of precisely the same dimensions, be placed together, end to end, they would thus form one double the length, and possessing exactly double the stability of either.

From this we may form a just estimate of the value of this collection of experiments. They may be divided into two parts, one relating to questions which have received thorough and satisfactory investigations, and with regard to which truth and falsehood have been accurately defined; the other part relating to questions as yet imperfectly solved, and to which therefore such authors as Mr. Bland consider themselves at liberty to attach such answers as accord with their peculiar tastes. Those of the former division are proved erroneous by the simplest tests, and we are thus justified in condemning the whole as unworthy of reliance.

Another mistake is made in the method given for finding the centre of gravity of a ship. I will make the following quotation on this subject my last;

"The place of the centre of gravity between the head and stern is ascertained pretty correctly by the surface of the water coinciding with the load-water line obtained and laid down from a correct model. But the axis of its height is extremely difficult of detection; and the readiest mode which presents itself would be, the placing of three or more cups or open vessels, filled with water, upon separate yet moveable shelves, a few inches or more perpendicularly above each other, at the centre of the ship's width and centre of gravity, taken lengthwise. This being done, and a lateral rolling motion communicated to the ship artificially, or the taking advantage of a light wind upon smooth water, and observing particularly the surfaces of the water in the cups,—then if the water in any one of them be seen to rise up first on one side, afterwards on the other, but in the remaining cups if the motion of the water be more rapid, even to overflowing, that first cup, wherever situated, cannot be far from the axis of lateral motion. Should any doubt on this question arise, just shift the said cup a trifle higher or lower, until the due quietude of its water surface be obtained."

That the centre of gravity of the ship and that of the water section are in the same vertical line is quite untrue; and the adoption of such a principle as a basis of calculation would be a source of serious error. Of course the centre of buoyancy can always be assigned without appreciable error, by means of the draught of the vessel; and this point is in the same vertical as the centre of gravity of the ship. The method given above for determining by experiment the height of the centre of gravity when the ship is afloat, is rather amusing than instructive. The philosopher who would set about this business in such a way would no doubt obtain, as he would certainly deserve, the laughter of all beholders. It will perhaps surprise Mr. Bland to be told that there is a ready method in which this experiment may be conducted to accurate success. This method he will find explained in many works on naval architecture, some of which works he would do well to study before he again appears before the world in the capacity of author in this branch of knowledge.

I think, Sir, you will now agree with me in the opinion that such a production as this affords no claim to the national thanks which "H. Y. P." wishes to award to Mr. Bland.

I am, Sir, yours, &c.,
A MECHANIC.

THE WESTMINSTER CLOCK AND BELL.

To the Editor of the Mechanics' Magazine.

SIR,—By way of bolstering up his original falsehood about the Westminster clock hammer, Mr. Loseby goes on adding more, hoping, I suppose, that he will at last get the public to believe some of them.

His last specimens are these.

1. That the clock is to strike the quarters from the second wheel in the train, though I condemned the same thing in the hour-striking part of the plan which the company of clockmakers wanted to foist upon the Government; and yet that the quarters have considerably more work to do than the hour part.

The clock does *not* strike the quarters from the second wheel, as Mr. Loseby would have seen, if he had condescended to look at the only book, where (as I told him two months ago) the construction of the clock is described (and which I see is referred to in the *Builder* of this week), the description in the Parliamentary papers having been only given as the basis of the contract, and subject to any variation by the Astronomer Royal and myself, and all details omitted. Moreover, the quarters will *not* have considerably more work to do than the hour, but less. And again, the striking of the hours from the second wheel was only one of a multitude of defects in the clockmakers' plan, any one of which rendered it unfit for its work.

2. It is not true, but is merely one of the stock falsehoods of the disappointed clockmakers, which has been exposed before, that I got myself made chairman of the horological jury in the Great Exhibition. On the contrary, it is well known that I refused to have anything to do with it, and the horological jury was unformed, until I was so pressed, that I could not decently refuse any longer.

3. It is not true, and Mr. Loseby knows that it is not, that I awarded the council medal to Mr. Dent's clock, made from my own design. I abstained, not only from voting, but from giving any opinion about it. The vote was proposed by a foreigner, and was confirmed unanimously by the rest of the jury, by the whole group of mechanical juries, and by the council of chairmen, and it was one of the very few council medals that were voted and confirmed unanimously. My refusal to have anything to do with that vote is fully stated in the Exhibition Report, which had to be passed by all the members of the jury, and by the officers of the Exhibition, and Mr. Loseby cannot pretend that he has not read it; at least, if he does, I can prove that he has read it.

4. He knows equally well that it is not true that I got myself appointed a joint referee of the clock; because the Parliamentary papers, to which he is constantly referring, show the contrary, and that I was appointed by the desire of the Astronomer Royal.

5. Neither is it true that I set aside the other referee. Mr. Airy retired after we had agreed on the construction of the clock, on account of a difference of opinion having no relation thereto, and when there was nothing more for him to do. And when it was finished, as far as it could be, without other work being done in the tower, he inspected it independently of me, and sent his approval of it to the Chief Commissioner of Works, and recommended that Mr. Dent should be paid a fair proportion of the contract price, which was done.

6. Mr. Loseby's assertion that I got myself appointed referee of the bells is specially false; because, after I had refused to act on a plan which I knew would not answer, and an attempt had been made by Sir W. Molesworth to get other referees, his successor applied to me again, and proposed a mode of doing the business under which I consented to act, and also to take the responsibility, which the bellfounders stipulated for, of furnishing the design of the bells, they only taking the risk of sound casting with such proportions of copper and tin as I should approve. I am, however, far from wishing to take the whole credit of what the *Times'* and other people, perhaps, rather better judges than Mr. Loseby, have called "this great success;" for I know that, but for Messrs. Warner's excellent management of the casting, *which has obtained a higher specific gravity than any known bell metal*, the best form and the best composition of metal in the world might have produced a bell as bad as the Oxford one, or, at any rate, no better than the other large bells in England, none of which are good.

7. Finally, Mr. Loseby knows very well that he is writing what is not true when he says that Mr. Dent had agreed to construct "*the* clock," by which he intends people to understand a clock on the present plan, or of the present size, with gun-metal wheels, for £1,600, and increased the price to £1,900 when I substituted cast iron. I repeat—because it ought to be generally known—that Mr. Dent's contract (which was only £1,800, exclusive of some alterations required by the internal construction of the tower) was very little more than half the estimate, either for Mr. Whitehurst of Derby's clock, or for that which the Astronomer Royal pronounced to be nothing better than "a large village clock," but which the London Company of Clockma-

kers put forward as the utmost perfection their art could reach; wherein I believe they spoke the truth; for, defective as Mr. Vulliamy's plan was, it was better than the regular style of Clerkenwell clock, in which no single scientific improvement has been admitted since the introduction of the dead escapement above a century ago, and never will be if they can help it; for it has become a proverb among persons conversant with machinery, that the English clockmakers (with very few exceptions) are the most ignorant, unprogressive, and obstinate of all the mechanical trades.

I have now only to thank Mr. Loseby for giving me an opportunity of telling the public a few things connected with this business, which they were not likely to know otherwise; and, having made the use I want of him, I wish him good bye. He must wait a little longer to pay off his old grudge on account of my former exposures of his horological pretensions, either by my own hands or by suggestions to the Astronomer Royal and other persons who have had to deal with his applications; for that is very well understood to be the real moving force of that 120 lbs. hammer with which he has set to work to beat down the credit of the Great Bell of Westminster.

I am, Sir, yours, &c.,

E. B. Denison.

STEAM SHIP ARITHMETIC.

To the Editor of the Mechanics' Magazine.

Sir,—In your last number is a letter intended by Mr. Atherton to enlighten "Enquirer" and other readers of the *Mechanics' Magazine*, on the subject of steam ship arithmetic.

It appears that "Enquirer" was unable to understand some expressions used by Mr. Atherton, in relation to this subject, in a paper previously published, and Mr. Atherton, I presume, in his letter, has made an extra effort so to clothe his ideas, as to bring them within the reach of your correspondent's capacity, and to render himself intelligible to ordinary readers. "Enquirer" has, I suppose, undergone the discipline afforded by the perusal of Mr. Atherton's first essay on this subject, and by the strength of mind acquired by this exercise, may be enabled to comprehend him. But I have not had the advantage of this discipline, and am therefore quite unequal to the attempt to unravel the meaning from the letter alluded to.

Mr. Atherton begins by saying, "I brought before public notice that a system of steam ship arithmetic might be based on the formula usually adopted for determining the coefficient or index number of dynamic duty of steam ships." There is something here which I do not quite understand. To say that a system of arithmetic *might* be based on a given formula, seems to me to imply that such a system was previously not so based. And yet the formula of which he thus speaks, Mr. Atherton also characterises as that "usually adopted for determining the co-efficient or index number of dynamic duty of steam ships." So it appears by his own representation, that this gentleman made the important discovery that that which had *already* been done *might* be done again.

In another place, we are told that to test the "dynamic efficiency" of a steam ship, "is the primary use of the formula

$$\frac{V^3 D^{\frac{2}{3}}}{\text{Ind. h. p.}} = C."$$

Here, I am obliged to ask the question which "Enquirer" has put already. I cannot imagine what is meant by "dynamic efficiency," if this expression, of itself, affords an estimate of it. The above equation is by no means a stranger to me; yet, I never knew it might be taken as the measure of a ship's efficiency. Indeed, it is difficult to see what notion can be attached to this word, subject to the conditions that the thing signified shall vary as the cube of the speed, and also as the two-thirds power of the displacement. We must have a definition of the term, if its author expects us to understand it, and fairly to judge of the merits of the proposition placed before us. Meantime, I will just direct attention to a point or two against which objections will probably be raised. We are told that for ships of similar types, though of various dimensions, the quantity C in the above equation is constant. This is theoretically true, but in practice, calculations founded on this assumption cannot be implicitly trusted. Indeed, so many circumstances, generally to the disadvantage of small vessels, interfere with the assumptions on which the theory is founded, that as a matter of fact, the formula is of very limited use. But, taking the truth of the theory for granted, we are led by Mr. Atherton to a conclusion to me paradoxical, namely, that vessels of the same form, and of various dimensions, are all equally efficient. To illustrate this, take two similar vessels A and B. Let the dimensions of B be double those of A, and therefore the displacement or carrying power eight times that of A. Suppose them to be propelled at the same speed V. Let P_a and P_b be their respective indicated horse powers and D_a and D_b their displacements, then

$$\frac{V^3 D_a^{\frac{2}{3}}}{P_a} = \frac{V^3 D_b^{\frac{2}{3}}}{P_b}$$

And since $D_b = 8\ D_a$

$$D_b^{\frac{2}{3}} = 4\ D_a^{\frac{2}{3}}$$

$$\therefore\ P_b = 4\ P_a$$

So that a vessel of eight times the carrying power of the first, would require only four times the consumption of fuel to propel her at the same speed, and yet these two steam ships, according to Mr. Atherton, would have the same index of efficiency and be equally economical. Again, this method of proceeding makes a vessel equally efficient, whatever be her power and velocity.

In conclusion, Sir, permit me to say that I am mystified, not enlightened, by Mr. Atherton's letter, and that, so far as I *can* understand it, it appears to be wrong.

I am, Sir, yours, &c.,

A Mechanic.

PATENT SMOKELESS FURNACES.

To the Editor of the Mechanics' Magazine.

Sir,—In perusing your version of the Liverpool Polytechnic Society's discussion on the smoke novelties, I was much surprised at the rude, uncalled for, and ungentlemanly attack made upon Mr. Williams.

The apparent position occupied by Mr. Williams is by no means uncommon in the archives of British arts and sciences; he seems to be one of those men whose intellects are so unruly that it is utterly impossible to induce them to mind *what is called* their own business, and who sometimes carry their ungovernable propensities to such an extent as to presume to substitute for the designs of eminent professional men certain simple laws of nature.

It is evident that Mr. Williams, in 1839, in a most obstinate manner, introduced one of those objectionable laws into a department of science of which he was not a titled professor, and upon which he relied as the source from whence he derived his income. It is also quite clear, from the first edition of that gentleman's treatise on combustion, that he was not taught in infancy to lisp Mr. Bourne's infallible catechism on the steam engine, and that his ideas of Nature's laws were not taken from the Artizan Club's slide-rule. Had Mr. Williams's good sense led him, instead of writing his mischievous prize essay, to have written a few clear, useful, and sensible chapters on boiler explosions—had he pointed out the economy of generating smoke in furnaces, and appended thereto the moderate terms upon which he might be advantageously consulted upon engineering subjects, the thing would have been quite different, and he might, notwithstanding his former misconduct, have escaped without censure.

It is very amusing, however, to observe the striking contrast presented by the conduct of Mr. Williams and that of his purely disinterested opponents. One eminent authority accuses him of having, in 1839, most stupidly and erroneously introduced perforated plates, &c., for the purpose of admitting atmospheric air to furnaces. Mr. Williams admits the charge, acknowledges having introduced the practice, defended its principle, and explained the *modus operandi* of his patent, when up starts Mr. O'Regan, at Liverpool, and declares in his face that "every word he (Mr. Williams) has uttered is false." Such is the general character of the evidence.

The first witness called in this furnace question, after having endured a short punishment, was thought to have been led away by injurious associates, and was presented with a ticket-of-leave on condition that his conduct in future should be more in harmony with the dignity of his profession. The second witness appealed to, claimed the merit due to Mr. Williams, and was presented with a vote of thanks by the Liverpool Polytechnic Society for having afforded so favourable an opportunity for exposing an attempted fraud.

Mr. Williams asserted that the perforated boxes or distributors invented by him had been in operation a dozen years. Mr. O'Regan denied his statements. I have not the pleasure of personally knowing either Mr. Williams or Mr. O'Regan, and you will, perhaps, allow me to state that the arrangements mentioned by Mr. Williams have, to my knowledge, been in operation for the last ten years, during which time I have conducted, and seen conducted, a series of carefully-performed experiments, with a view to maintain in the furnace, under all circumstances, what few besides Mr. Williams have deemed worth a moment's consideration, viz., the equivalents necessary to effect perfect combustion, and therefore to prevent the formation of smoke. Many have tried what they call Mr. Williams's plan of admitting cold air into furnaces, and have totally failed in producing the desired effect. But who that have tried the equivalents he names, have ever been known to fail? To say any one had, would be considered by any scientific jury to libel the laws of nature.

Seventeen years since, Mr. Williams, backed by the experience of six thousand years and every chemist in Europe, proceeded, to the great consternation and alarm of engineers, to tear down their iron impediments which thwarted the laws of

nature, admitted the air to the furnace, and directed our attention to the universally-recognized rules of chemical equivalents; and when we have adapted the supply of air to the requirements of the furnace with as much precision as nature supplies in the varied requirements of the human lungs, we shall then have carried out Mr. Williams's instructions; and should we then fail in producing the promised effect, we ought heartily to join with Mr. O'Regan in saying that "Mr. Williams was deluding the public," and that Nature's secret was enclosed "in his (Mr. O'Regan's) box." But while every chemist continues to support and demonstrate the truth of Mr. Williams's statements, and while Mr. O'Regan continues to instruct his smith to blow cold air into his forge-fire, in order to obtain a temperature of 15,000°, we are bound to believe that Mr. Williams is not deluding us, and that Mr. O'Regan's notorious "box" contains no secrets whatever save those which relate to £ s. d.

I am, Sir, yours, &c.,

AN ENGINEER.

January 19, 1857.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

WHYTLAW, R. A., and A. MITCHELL, jun. *Improvements in weaving.* Dated May 24, 1856. (No. 1246.)

This consists—1. In the use in looms for weaving with two or more shuttles, of self-acting mechanism for changing the shuttles according to a desired pattern; the period of each change is effected by the shift round of a wheel, to the indented periphery of which a lever connected to the shuttle drop-box adjusts itself. 2. In the use in such looms of a jacquard apparatus contrived to effect the rectilinear shift of the shuttle-box by which the shuttle is changed.

DIMPFEL, F. P. *Improvements in the construction of steam boilers and furnaces.* Dated May 24, 1856. (No. 1248.)

Claims.—1. Arranging the tubes of tubular boilers so as to form a flue between them, and placing in this central flue deflectors for checking the particles of fuel carried forward from the fire chambers by the draught, and causing them to fall to the bottom of the flue. 2. Connecting with the bottom of the main flue containing the tubes receptacles for receiving these fine particles of the fuel. 3. Fitting in the bottom of the main flue or flues of steam boilers, and of the receptacles, air tubes covered by deflecting plates, for introducing air to the fine particles of fuel, and causing it to impinge thereon in a thin film, to assist in consuming the same. 4. Connecting the bent up ends of the water tubes to a concave crown sheet in a series of double longitudinal rows, with spaces between the double rows to admit of the easy removal of old and insertion of new tubes.

BUFFON, B. N. DE. *A new apparatus for clarifying and purifying water and other liquids.* Dated May 26, 1856. (No. 1250.)

This invention consists in a mode of constructing filtering apparatus, in which the liquid passes from the outside to the inside of the apparatus.

GAGET, A. A. *Improvements in book-binding.* Dated May 26, 1856. (No. 1251.)

This consists—1. In the employment of hooks for holding sheets of paper or pamphlets together at top and bottom. 2. In the application at top and bottom of a hold-fast or connecting piece in an inclined position over all the hooks, for obtaining a firmer hold. 3. In the use of a back, by preference of wood, furnished with grooves to receive the pressure hooks and connecting pieces.

NORMANDY, A. R. LE M. DE. *Improvements in obtaining fresh water from salt water.* Dated May 26, 1856. (No. 1252.)

The principal novelties in this system are—1. The process of double distillation, whereby aerated and non-aerated fresh water are produced, and in which they may be mixed for sweetening the whole. 2. Two kinds of water regulators described, or any water regulator keeping the water in the evaporating cylinder at a given level. 3. A steam tap. 4. A priming box. 5. An animal charcoal filter of any form.

HULSE, W. *An improvement or improvements in metallic and other bedsteads, which improvement or improvements may be applied to other articles of furniture, and to framework generally.* Dated May 26, 1856. (No. 1254.)

This cannot be described without illustrations.

COWPER, C. *Improvements in the treatment of coal, and in the purification, desiccation, and agglomeration of coal, and in machinery and apparatus for such purposes.* (A communication.) Dated May 26, 1856. (No. 1255.)

This relates to separating coal from pyrites, schist, &c., by the action of water, and in drying the coal, and converting it into artificial fuel, or agglomerating it with the assistance of heat, and in apparatus for such purposes.

HEYWOOD, B. J. *Improvements in holders for leads, slate, and other marking materials.* Dated May 26, 1856. (No. 1256.)

Holders, fitted with helical groove propellers, have inserted in the central bore of the case an open tube, in which the lead is placed, and in rear thereof is the propeller,

which is guided down by the helical groove of the outer case, and thrusts the lead forward.

JEUNE, F. C. *An improved manufacture of floor-cloth.* Dated May 26, 1856. (No. 1257.)

The patentee mixes in a masticating machine, India rubber (partly the waste of vulcanised India rubber) and gutta percha, to produce a binding substance, and throws in ground cedar wood, or other vegetable dust, for increasing the bulk, and reducing the cost. When the mixing is effected he adds fibrous substances in length, to impart toughness, and rolls the compound between rollers into sheets, which he submits to steam or hot air, to complete the adhesion of the particles.

NEWTON, W. E. *An improvement applicable to quadrants and other instruments for taking the altitude of the sun or other objects.* (A communication.) Dated May 26, 1856. (No. 1258.)

This consists in the attachment to quadrants, sextants, or octants of a level made adjustable, that it may be set true while the instrument is in position for taking an altitude when the horizon is visible, after which it serves as a guide when no horizon is visible.

NEWINGTON, S. *A preparation for destroying the fly or aphis, and other insects, on hop and other plants.* Dated May 26, 1856. (No. 1260.)

Strong tobacco is boiled in water (not allowing the steam to escape) and vinegar is added. The liquor is pressed out of the tobacco, and it is applied to slack lime, and the powder produced is packed in cases.

ROBERTS, J. *Improvements in machinery for moulding bricks and tiles.* Dated May 26, 1856. (No. 1261.)

At intervals, in a circular track, separate sets of moulds are fixed. Each mould is a box, of the shape of the bricks (or tiles) to be made, and has within it a moveable bottom, which, when the clay is introduced, is in the lowest position. Heavy rollers revolve around the circular track, and press on the clay as they pass over the moulds, and then by passing over a lever (to which all the bottoms of the moulds are connected) raise the whole, and thus lift the bricks above the edges of the moulds, to be removed by hand.

CHARLTON, T., and W. TURNBULL. *Improvements in steam engines.* Dated May 26, 1856. (No. 1262.)

This consists—1. In improvements in the valves of steam engines. 2. In connecting the steam valves direct to the boilers by a yielding steam pipe or hollow piston. 3. In working the expansion valves in conjunction with the cylinder valves of steam engines,' by two eccentrics connected to one or more links. The exhaust steam passes off in the usual way, but a portion of it passes into the steam chest on the outside of the valves for lubricating them.

BAIRD, J. *A method of freeing the wool upon skins from burrs and other extraneous substances.* Dated May 26, 1856. (No. 1263.)

Revolving arms, beaters or switches brushes, or elastic springs, are made to act upon the face of the wool while being held between rollers or otherwise, in order to beat out burrs, &c.

HILLS, F. C. *Improvements in the purification of gas.* Dated May 27, 1856. (No. 1266.)

Claims—1. For purifying gas (whether escaping into the retort-house or into the hydraulic main) combining the use of steam, with the use of purifying liquids in scrubbers or purifiers, containing the purifying and divided media. 2. The employment, in the scrubber, of a warm purifying liquid. 3. The distribution of the purifying liquid over the divided media by means of filtering-plates or diaphragms. 4. Forming the scrubbers or purifiers of a series of such filtering plates or diaphragms, instead of coke or other divided media. 5. Spreading water by a jet of steam.

NEWTON, W. E. *Improvements in printing machinery.* (A communication.) Dated May 27, 1856. (No. 1267.)

This relates to printing machinery in which the types are secured to the surface of a cylinder. The types are held in their place by means of the column rules which divide the columns one from another. The rules are formed to suit the purpose.

NEWTON, A. V. *Improvements in reaping machines.* (A communication.) Dated May 27, 1856. (No. 1268.)

This relates to an arrangement of raking apparatus for reaping machines, worked automatically from the main wheel of the machine, and delivering the grain in sheaves in rear of the driving apparatus.

DIMPFEL, F. P. *Improvements in constructing the permanent way of railroads.* Dated May 27, 1856. (No. 1269.)

The patentee imbeds the foot of the rail in grooves in the sleeper. He cuts the latter longitudinally down the middle, and by a suitably-shaped cutting tool, cuts out grooves in the inner side of the two halves.

OWEN, L. D. *Improvements in the manufacture of artificial stone.* (A communication.) Dated May 28, 1856. (No. 1270.)

Building blocks are formed as follows:—A quantity of coarse siliceous sand, as free as possible from clay or other earth, is provided, with a quantity of freshly-

slacked lime in powder. As much sand and lime as can be moulded in an hour are then thoroughly mixed (about one part of lime to from six to twelve of sand), the lime being the dry powder hydrate, produced when lumps of calcined limestone are freshly slacked, and the sand having the moisture it has when dug out of the earth. This composition is then placed into the mould of a moulding-press, and submitted to great pressure, and the blocks so produced are then taken out of the mould, placed upon a flat surface, and exposed to the air to harden.

HOLT, C. H. *Improvements in steam-boilers, furnaces for the same, and apparatus connected therewith.* Dated May 28, 1856. (No. 1274.)

This consists—1. Of a method of obtaining an upward and downward draught in furnaces. 2. Of an improved diminishing or equalising valve worked with mercury, having an arrangement to alter the same to work at any required pressure. 3. Of a feed water warming apparatus, which is inserted in the exhaust steam pipe of the engine, through which the water is forced by the force pump into the boiler. 4. Of a steam gauge worked with mercury, placed in a vertical tube with a glass indicator and descending scale, to show the height of mercury in the tube, and thereby indicate the pressure of steam or fluid.

BELL, G., and G. C. GRIMES. *Improvements in the manufacture of frictional matches and fusees.* Dated May 28, 1856. (No. 1275.)

The pieces of wood of which the matches are composed are made pointed, so that they can be dipped into the stearine and the igniting compound in bundles, in place of being held in frames, and they are cut by suitable machinery. The patentees sometimes dip them in resin or pitch, instead of sulphur. In making fusees, a shaving of wood is placed on one side of the paper, to give strength, and by extending beyond the paper becomes a handle.

WHITTAKER, O., and C. WALLWORK. *Improvements in weaving figured fabrics.* Dated May 28, 1856. (No. 1277.)

This relates to the jacquard, or other similar apparatus, and its object is a more steady change in the shed of the warp, combined with a higher rate of speed. Two "griffs" or "knife-boxes" are used to one set of hooks, capable of advancing towards and receding from each other, each of such griffs or knife-boxes acting by direct means, and by aid of additional projections or loops upon the hooks, so as to raise any one desired, or to descend with it according to the shed desired.

HUTTON, W. C. *Improvements in stamps or hammers worked by power.* Dated May 30, 1856. (No. 1281.)

This invention was described and illustrated at page 25, of No. 1744.

WEEMS, J., and J. H. MCCRINDELL. *Improvements in the manufacture or working of metals and their ores.* Dated May 30, 1856. (No. 1282.)

This invention relates to those processes in the melting or after manufacture wherein air is used for aiding the action of the furnace, and consists in heating such air by means of steam-heated surfaces.

STOTT, F. L., T. BELWARD, and J. FINDLOW. *Improvements in machinery or apparatus for washing wool or garments, and other articles made of textile fabrics.* Dated May 30, 1856. (No. 1283.)

A steam-tight vessel encloses a rotating perforated drum or frame in which the wool, &c., is placed (through doors in each) and steam is admitted into the outer vessel. The drum or frame has internal ribs which carry the wool, &c., round.

HEAL, J. H. *An improvement in hair and wool mattresses.* Dated May 30, 1856. (No. 1284.)

A comparatively thin mattress is made, and tied in the ordinary manner, and on either surface a further quantity of hair or wool is placed, and the whole is covered with a suitable case, and again tied through. The object is to produce a mattress which will retain its form better than the ordinary ones.

CALVERT, F. A. *Improvements in machinery for opening, cleaning, and carding cotton and other fibrous materials.* Dated May 31, 1856. (No. 1286.)

This consists—1. In the application of revolving drums, with combs for opening and cleaning cotton, &c. 2. The application of drums with combs, in combination with a toothed cylinder, &c., forming a complete machine for opening and cleaning cotton, &c. 3. The application of working rollers to a toothed cylinder, when employed for the above purpose. 4. In a mode of constructing "grids" for machines used for the above purpose, when employed in combination with revolving cylinders or drums, or in segments of circles. 5. In making the feed rollers of carding engines, one with a plane, and one with a toothed surface.

WATSON, A., and A. H. WILLIAMS. *An improvement in bottles, flasks, and other like receptacles for liquids.* Dated May 31, 1856. (No. 1287.)

An orifice or air-vent is formed in the necks of bottles, flasks, &c., to allow the entrance of air, the main object being to enable parties to drink easily out of flasks.

BESSEMER, H. *Improvements in shaping, pressing, and rolling malleable iron and steel.* Dated May 31, 1856. (No. 1290.)

These improvements were described at page 556, of No. 1740, vol. lxv.

JOBSON, R. *Improvements in apparatus for making moulds for casting metals.* Dated May 31, 1856. (No. 1291.)

This invention was described and illustrated at page 73 of No. 1746.

BESSEMER, H. *Improvements in the manufacture of iron and steel.* Dated May 31, 1856. (No. 1292.)

These improvements are described at page 556 of No. 1740, vol. lxv.

GOSSAGE, W. *Improvements in the manufacture of certain kinds of soaps.* Dated May 31, 1856. (No. 1293.)

This consists—1. In the manufacture of compound soap (containing silicate of soda or of potash), in which the oily, fatty, or resinous matters or acids employed have been caused to abstract a portion of alkali from such silicate of soda or of potash, and thereby to produce compound soap containing silicate of soda or of potash of mild quality; also, in the manufacture of such compound soap, in which bicarbonate or sesqui-carbonate of soda or potash is used for rendering the above silicates of milder quality. 2. In the manufacture of compound soaps of good detergent quality, by adding bi-carbonate or sesqui-carbonate of soda or of potash, or by adding precipitated carbonate of lime, of magnesia, or of alumina, or by adding precipitated silicate of lime, of magnesia, or of alumina to true soaps.

BLACKWOOD, R., sen. *Improvements in machinery or apparatus for doubling yarns or threads.* Dated June 2, 1856. (No. 1296.)

Claims.—1. A general arrangement of mechanism for stopping the action of the drawing rollers and spindles of doubling, twisting, or spinning frames when a yarn or thread breaks or fails. 2. The use in such frames of a spring movement for stopping the action of the drawing rollers and spindles when a thread breaks or fails, such movement being released by the falling down of a lever held up by the thread when unbroken and passing continuously from the delivery bobbin to the rollers or spindle, as described. 3. The application of fast and loose pulleys to the spindles of such frames for stopping the action when the threads break or fail.

CARTWRIGHT, H. *Improvements in the application of steam cocks to steam engines, and in working such engines thereby.* Dated June 2, 1856. (No. 1297.)

This relates to two-cylinder steam engines, each cylinder having two steam cocks of the construction described in the specification of a patent of the patentee's, dated 2nd June, 1855, and consists in applying to such engines another pair of such steam cocks, and in combining all the steam cocks and steam passages, so as to admit of the engine being started, stopped, or reversed by means of the additional pair of steam cocks worked by hand gear.

WILSON, T. *An improvement or improvements in screw-wrenches.* Dated June 2, 1856. (No. 1298.)

Screw-wrenches are constructed with a supporting screw directly under the moveable jaw, the said screw engaging in a concave screw nut or screw box, formed in or attached to the lower part of the body of the wrench.

GIDLEY, G., and W. CHRISTOPHER. *Reducing the bottle or imported India rubber to a transparent liquid state, so that it may be used as a transparent varnish or solution for mixing with colors.* Dated June 2, 1856. (No. 1299.)

This consists in subjecting India rubber (preferring the bottle India rubber) to an alkaline action, also to boiling in water, and then dissolving the India rubber in suitable solvents.

PARKHURST, S. R. *Improvements in paddle-wheels for steam boats and vessels.* Dated June 2, 1856. (No. 1300.)

Diamond-shaped buckets are formed, at suitable distances apart, of straight plates, formed into a zig-zag shape, and jointed in pairs at the apex.

HEYWOOD, B. J. *An improved construction of holder for leads and other marking materials.* Dated June 2, 1856. (No. 1301.)

This relates to holders fitted with propellers, and consists in propelling the lead of pencil cases towards the point of the case by a loose propeller, acting by impact,

CADET, A. *An improved stamp-inking apparatus.* (A communication.) Dated June 2, 1856. (No. 1303.)

The inking bed is inclosed in a box, and consists of a block of wood raised from the bottom by pieces of wood fixed to it. Upon the top of this block sheets of wadding are placed, and covered tight over by a black oil-cloth, greased on its under surface.

HERLAND, A. M. *A new regulator penholder.* Dated June 2, 1856. (No. 1304.)

The pen is held between two metallic tubes, rendered flexible by incisions in one of them. The outer tube slides on the inner, by which the pen is held, and the means afforded of fixing it at any given point, and of changing it when required. There is fixed on the side of the outer tube a small curved plate called a regulator, in which the middle finger is to be placed, for securing the proper position of the hand in writing.

MAUBAN, V. J. B. *Certain improvements in the manufacture of cans for holding oils and other liquids.* Dated June 2, 1856. (No. 1305.)

This consists in applying to the orifices

of cans for holding oil, a valve or stopper worked by a rod and kept closed by a spring, thereby enabling the can to be placed at any inclination without the contents being wasted.

McConnell, J. E. *Improvements in locomotive engines.* Dated June 2, 1856. (No. 1306.)

Claims.—1. The application to the fire boxes or furnaces of high-pressure boilers of water spaces or partitions placed transversely or longitudinally, and fitted with hollow stays for the passage of heated air to the fire. 2. The introduction of heated air from the smoke box to the fire in the fire box, as described. 3. The heating of the feed water in an annular vessel on the top of the smoke box, as described. 4. The use of adjustable fire-bars for regulating the admission of air to the fire. 5. The construction of certain solid wrought-iron or steel pistons, in combination with a mode of admitting steam behind the packing-rings, as described. 6. The use of wrought-iron or steel pistons, consisting of a simple disc in one piece with their piston rods, and circumferentially grooved to admit packing rings, such rings being kept tight by their own inherent elasticity, and also acted upon by springs or steam pressure, separately or in combination, as described.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Gedge, J. *Improvements in machinery or apparatus for the manufacture of billiard cues or similar articles.* (A communication.) Dated May 23, 1856. (No. 1235.)

The inventor proposes to taper billiard cues by the use of two bars or puppets, fixed in a framing supporting conductors, &c.

Gedge, J. *Improvements in the means of adjusting the parts of ladies' dresses called crinolines and sous-jupes.* (A communication.) Dated May 23, 1856. (No. 1236.)

This consists in forming the above articles of a light air-tight stuff, capable of collapsing, and having a small aperture, in order that, by a minute pair of bellows of very slender form, air may be forced in. A second aperture allows the emission of air when ladies wish to sit down.

Galloway, G. B. *Improvements in the furnaces of marine boilers, and in the construction of steam vessels.* Dated May 23, 1856. (No. 1238.)

The boiler has additional fire places to consume coke (or other suitable fuel) over which the flames from the other fires are caused to pass by flues or tubes. An air channel extends across the front of the several fire-places, just under the fire doors. In this channel are apertures with short pipes communicating with the fire door frames, and also the fire-bars which are hollow, and have apertures through which the air escapes through the bridges. An inclined grate is fixed below the fire bars, to catch the cinders. The steam vessels are constructed with a series of hollow pipes or channels at the upper part, between the bulwark and the bend of the vessel, forming a kind of buoyant sheathing for the vessel. Tubes are also inserted between the timbers and underneath the beams and decks.

Dixon, J. *Improvements in apparatus for measuring water and other liquids.* Dated May 23, 1856. (No. 1240.)

The documents relating to this invention are with the law officers.

Jundzill, A. D. *An instrument for animating stereoscopic figures.* Dated May 24, 1856. (No. 1245.)

This consists in an application of the stereoscope to the phanakistiscope or sobroscope invented by Plateau.

Lea, J. *Improvements in sun-blinds.* Dated May 24, 1856. (No. 1247.)

The object here is to avoid the use of the projecting horizontal iron rods used in supporting sun-blinds. The improvements cannot be described without illustrations.

Liptrap, S. D., and J. Wright. *Improvements in apparatus for regulating the mode of supplying and drawing off water and other liquids.* Dated May 24, 1856. (No. 1249.)

The inventors propose an arrangement for drawing off the liquid at or near its surface, or beneath the surface.

Rye, W. *Certain improvements in fixing or fastening rails or railways in their chairs.* Dated May 26, 1856. (No. 1253.)

In one side of an ordinary chair is inserted a wrought-iron screwed nut (or nuts) in which works a screw bolt (or bolts) the head of such bolt being secured against an intermediate block or plate for holding the rail, which block fits the outside of the rail, and dispenses with the use of wedges. Between the rail and that part of the chair upon which the rail usually rests, a space is left.

Foster, T. *Improved apparatus for holding postage, receipt, and other stamps.* Dated May 26, 1856. (No. 1259.)

This consists of a hollow cylinder, through which is passed a spindle provided at one end with a knob or handle, whereby it may be rotated. The stamps are cut into convenient lengths, and one end of the length is attached to the spindle inside the cylinder, by passing it through a slit or otherwise. The other end is passed through a slit in the cylinder. Stamps may be torn off as required.

YATES, H. G. *An improvement in treating wash waters in order to precipitate the greasy and soapy matters contained therein.* (A communication.) Dated May 26, 1856. (No. 1264.)

The greasy and soapy matters contained in water in which wool, cotton, &c., have been cleansed, are precipitated by means of rock salt, sulphate of zinc, and arsenic.

TALBOTT, E. *Improvements in the construction of rails for railways.* Dated May 27, 1856. (No. 1265.)

The improved compound rails are somewhat similar to two bars of T-iron placed side by side in reversed position, bolted at intervals, and connected with fish-joints or otherwise.

MACDONALD, J. *Improvements in the reflection, emission, and radiation of light and heat for lamps, lighthouse apparatus, and other useful purposes.* Dated May 28, 1856. (No. 1271.)

This invention cannot be described without illustrations.

CLARK, J. *Improved horse-shoe.* Dated May 28, 1856. (No. 1272.)

This horse-shoe cannot be described without illustrations.

FULTON, W. *Improvements in preparing and spinning fibrous materials, and in machinery or apparatus employed therein.* Dated May 28, 1856. (No. 1273.)

The essential feature here is the use of a tumbling lever or finger, over or through which the thread yarn or roving passes, the breaking or failing of which thread yarn or roving, causes such lever or finger to bring into play suitable mechanism to cause the discontinuance of the action of the machine on that particular thread yarn or roving, or on the compound thread or yarn of which it should form part.

BROOMAN, R. A. *An improved coating or composition to be applied to substances in order to render them uninflammable, and in the method of, and apparatus for manufacturing the same.* (A communication.) Dated May 28, 1856. (No. 1276.)

In a suitable furnace are placed certain proportions of sand, soda, lime, and wood charcoal, and the whole are stirred well together, and then cooled, pounded, and dissolved in a mixture of water, alum, and sulphate of lead. The compound is then well stirred, the clear liquid run off, and portions of the mixtures boiled down with water.

HOUT, H. J. VAN DEN. *Improvements in the preparation of pulp for the manufacture of paper, millboard, and other like purposes.* Dated May 30, 1856. (No. 1278.)

The inventor takes curriers' shavings, washes them thoroughly, and transfers them to the ordinary pulping machine, adding from 15 to 60 per cent. of any common pulp. Or he takes the offals and cuttings of all kinds of leather, soaks them in water, puts them in a fuller's mill with fuller's earth, and beats them until they become quite soft and easily divided, after which they are treated in a pulping machine, and mixed up with suitable pulp.

DREW, A., and M. GRAY. *Improvements in weaving.* Dated May 30, 1856. (No. 1279.)

This relates to means of weaving checked or cross-over cloth in power-looms, the object being to produce it by a single shuttle, passed more than once through the same warp shed whilst the warp remains motionless, and thereby causes two or more plies of the weft to be woven as one ply. A cord will thus be shown in the cloth, or the cloth will have the appearance of being woven by two different sizes of weft. The essential feature is the so arranging the tappet movement for working the treddles that one, two, or more weft shots may be thrown into a single shed of the warp at intervals, according to a predetermined pattern, by rendering the tappets inoperative in changing the warp shed when more than one weft is to be thrown in.

BETHUNE, D. *Certain improvements in apparatus for dyeing.* Dated May 30, 1856. (No. 1280.)

This consists in the formation of a vacuum or a partial vacuum in a vessel, chamber, or dyeing vat, and in forcing the dye liquor in by a force pump.

BONVALLET, A. *Certain improvements in printing woven fabrics, velvet, skins, and other like materials.* Dated May 31, 1856. (No. 1285.)

This consists in the employment of a very narrow border or rim, of a height proportionate to the effect to be obtained, on the contour of the vignette which is cut out.

ALLMAN, F., and D. BETHUNE. *Certain improvements in apparatus for separating fluids from solids, or for separating the more fluid particles from the more solid of various bodies.* Dated May 31, 1856. (No. 1289.)

Centrifugal force is employed to produce in a chamber a vacuum or partial vacuum, by suitable mechanism, and hot air is forced into the chamber by means of an air force-pump.

SPINK, D. *Improvements in rails and railways.* Dated May 31, 1856. (No. 1294.)

This consists—1. In a new form of rail having flanges on each side, rolled out of the rail itself. These flanges are at right angles to the neck of the rail, and equidistant from the upper and lower faces. 2. In laying the rails, which are to be sunk

into the ground or ballast half-way, as far as the side flanges; either angle or bar iron may be used as braces to keep the line to its gauge. Timbers and chairs are thus dispensed with.

FOWKE, F. *An improved portable photographic camera.* Dated May 31, 1856. (No. 1295.)

The front part of the camera is constructed in the form of a four-sided cone made of wood, each side hinged, and folding down flat one over the other, so as to be enclosed in a shallow frame.

DIEUDONNÉ, L. A. *Improvements in nose-bags.* (A communication.) Dated June 2, 1856. (No. 1302.)

The bag has an additional strap or rope attached at its sides towards the top, so as to form a loop for encircling the horse's head; and at each side of the double strap or loop rings are adapted. The extremities of a rope passing through the rings are so fixed that when the horse lowers his head the rope will pull up the bag towards the horse's head, and when he raises his head the contrary effect will take place, so as, in both cases, to prevent waste of fodder.

GROLEY, J. *An improved plough.* Dated June 2, 1856. (No. 1309.)

Two supplementary supports are supplied to ploughs, consisting of wheels or shoes, one fixed to the beam at the side opposite to the mould board, either behind or in front of the share. This also acts as a counterpoise, and when the plough travels produces an oscillating motion, similar to that produced by the hand of the ploughman. The other wheel or shoe is in front of the beam, and travels in and regulates the depth of the furrow. A toothed regulator is placed in front of the wheel to regulate the width of the furrow, and the draught.

PROVISIONAL PROTECTIONS.

Dated November 26, 1856.

2802. Francis North Clerk, of Birmingham, engineer. Improvements in metallic roofing for buildings, and in appendages to roofs.

Dated December 9, 1856.

2916. Thomas Peake, of Abbey-street Mill, Derby. Certain improvements in the manufacture of chenille, and other piled fabrics.

Dated January 12, 1857.

98. George Fergusson Wilson, of Belmont, Vauxhall. Improvements in treating Burmese and such like petroleum, and their products.

100. Joseph Bennett Howell, of Sheffield, steel manufacturer, and Nicholas Harvey, of the Haymarket, engineer. Improvements in the manufacture of steam boilers.

102. George Eskholme and Henry Wilkes, both of Rotherham, engineers. Improvements in apparatus for preventing waste of water from service pipes and cisterns.

Dated January 13, 1857.

104. Alfred Bower, of Liverpool, cotton broker. Improvements in or applicable to the keels of navigable vessels.

108. David Cheetham, of Rochdale, machinist. Improvements in apparatus applicable to steam and other boilers.

110. Robert Cameron Galton, of Ham-common, Surrey. An apparatus for giving alarm to the inmates of dwelling houses in cases of burglary.

112. John Barsham, of Albert-road, Kingston-upon-Thames, Surrey, manufacturer. An improvement in the manufacture of mats or fabrics used for packing.

Dated January 14, 1857.

114. Sir James Murray, knt. and M.D., of Dublin. Abating the smells and increasing the fertilizing usefulness of liquid manures, sewage, gas, or other liquors, and for means of raising or propelling such mixtures and other solids or fluids to convenient heights or distances.

116. John Coope Haddan, of Cannon-row, Westminster, civil engineer. Improvements in smelting ores, and in roasting and extracting products therefrom. A communication.

117. William Edward Newton, of Chancery-lane, civil engineer. An improved steam engine. A communication.

118. William Edward Newton, of Chancery-lane, civil engineer. An improvement in rollers employed in calendering, mangling, and other processes of analogous character. A communication.

119. Gustav Adolph Blittkowski, of New York, U. S. A. Improvements in breech-loading fire-arms.

Dated January 15, 1857.

120. Alfred Charles Hobbs, of Cheapside. An improvement in locks and latches.

121. David Hamilton Fowler, of New Orleans, U. S. A. An improvement in steam boilers.

122. George Parker, of Manchester, cotton dealer, and William Martin, of the same place, manager. Certain improvements in machinery for opening, cleaning, and preparing cotton.

123. Joseph Higham, of Manchester, musical instrument manufacturer. Improvements in valve musical instruments.

124. Charles Wye Williams, of Liverpool, gentleman. Improvements in furnace grates and fire-bars.

125. Thomas Frederick Henley, of Bromley, Middlesex. Improvements in the preparation or manufacture of certain beverages or liquors of the nature and character of home-made wines, and in the means of obtaining the same.

126. Francis Watkins, of Birmingham. Improvements in machinery for manufacturing bolts, spikes, and rivets.

127. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. An improvement in steam engines. A communication.

128. Julius Homan, of Milk-street, Cheapside, manufacturing outfitter. Improved machinery for folding cloth into lengths.

129. George Bedson, of Manchester, manager. Improvements in coating and insulating wire.

130. Matthew Andrew Muir, of Glasgow, machinist, and James McIlwham, of the same place, machinist. Improvements in moulding or shaping metals.

131. Robert Adamson, of Preston, ironfounder, and Richard Holland, of the same place, engineer. Certain improvements in looms for weaving.

Dated January 16, 1857.

132. Samuel Haycraft, of Birmingham, commission agent. Improvements in anchors.

133. Thomas Jackson Milnes Townsend, of Searby, near Brigg, Lincoln. Improvements in

drain pipes, and in machinery for producing the same.

134. John Edridge, of Birmingham, pin manufacturer. Improvements in safety pins for dress and other similar purposes.

135. Henry Henson Henson, of Parliament-street, Westminster. Improvements in treating animal and vegetable fibre and fabrics for preserving or waterproofing the same.

136. George Storey Moore, of Monkwearmouth, Sunderland. An improvement in combining steam engines and boilers, when used with screw or stern propellers of ships or vessels.

137. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton. Improvements in sewing machines. A communication.

138. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in scutching machines. A communication from C. Leyherr.

Dated January 17, 1857.

140. Prix Auguste Théodore Pichon, of Dijon, France. An improved process for accelerating tanning without the assistance of acids foreign to the bark.

141. Charles Fréderic Vasscrot, of Essex-street, Strand, mechanical draughtsman. A new beverage. A communication from E. Marchand.

142. Charles Fréderic Vasserot, of Essex-street, Strand, mechanical draughtsman. Covering all descriptions of grain with a fertile substance or manure, and the apparatus employed for the same. A communication from L. M. P. M. d'Illiers.

143. John Dennison, of Halifax, York, woollen manufacturer, and Henry Hirst, of the same place, overlooker. Improvements in looms for weaving.

144. Peter Walker, of Warrington, Lancaster, brewer. Improvements in apparatus employed in distilling, and in the manufacture of vinegar.

145. Augustin Leopold Autran, of Rue de l'Echiquier, Paris. Certain improvements in the wicks of candles and lamps.

146. Joseph Cooke and William Cooke, of Shrewsbury, manufacturers. A new or improved rotatory machine, to be used as a steam engine, water-wheel, fire-engine, or pump.

147. Andrew Steinmetz, Barrister-at-law, of the Middle Temple, and Edith Villas, North End, Fulham. The improvement of circular gas-burners and their chimneys, to be called the Steinmètz burner and Steinmetz chimney.

148. Robert Reeves and John Reeves, of Bratton, Westbury, Wilts, agricultural implement makers. Improvements in machinery for delivering manure for agricultural purposes.

149. William Warne, of Tottenham, Middlesex, India rubber manufacturer. Improvements in the manufacture of deckle straps.

150. John Long, of Tiverton, Devon. Improvements in the fastenings of brooches and other articles of jewellery.

Dated January 19, 1857.

151. Nicolas Fortune, of Paris, cutler. Improvements in the manufacture of knife handles.

152. Henry Vannoy, of Rue de Faubourg du Temple, Paris, gentleman. Certain improvements in heating foot-stoves, beds, and applicable to various other similar purposes.

153. Thomas Sagar, of Burnley, Lancaster, machine maker, and Christopher Turner, of the same place, machine maker. Certain improvements in power looms for weaving.

155. William Haslett Mitchel, of Brooklyn, U. S. A. Improvements in means for distributing and composing types.

157. Edwin Clark, of Great George-street, Westminster, civil engineer. Improvements in floating docks.

158. John Bird, manager of Chance's Fire-brick Works, near Dudley. Improvements in the manufacture of articles suitable to be used as window heads and sills, lintels, and other similar parts of buildings.

159. Edwin Clark, of Great George-street, Westminster, civil engineer. Improvements in machinery or apparatus for raising ships out of the water for the purpose of examination and repair.

Dated January 20, 1857.

161. Thomas Edwards, of Brierley-hill, Stafford, engine fitter, and Daniel Rowley, of Brierley-hill, roller maker. New or improved machinery for rolling taper bars.

165. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in the manufacture of petticoats and other knitted fabrics on circular looms or frames. A communication from Mons. Lucevilliard.

167. Thomas Johnson, of Runcorn, Cheshire, soap manufacturer. An improvement in purifying alkaline lees.

169. William Henry Barlow, of Derby, and Henry Woodhouse, of Parliament-street, London. Improvements in the permanent way of railways.

171. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in apparatus for the preservation of life and property at sea. A communication from J. T. Garlick.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

180. Thomas Kitelee, of Everett-street, Brunswick-square, surgeon and chemist. An improved combination of ingredients to be employed as a breakfast powder, or article of diet. Dated 21st January, 1857.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," February 3rd,* 1857.)

2233. A. Barrie. A new or improved instrument or apparatus for registering the time at which workmen arrive at and leave their place of work, and for other such like purposes.

2244. J. W. Wilson. Improvements in machinery or apparatus for manufacturing parts of brooms and brushes.

2254. C. Langlois. Improvements in photography.

2255. J. F. Meakin. An improved fire-escape.

2259. G. G. Woodward. Improvements in the manufacture of carpets.

2263. G. Meall. An improved union gas-stove for lighting and heating.

2269. J. Edwards. An improved ships' log.

2274. C. J. Carr. Improvements in operating hammers and stamps.

2275. J. N. Ward. An improvement in the construction of self-priming fire-arms.

2289. D. Bruce. Making a concentrated animal manure.

2300. C. D. Gardissal. Improvements in stoves and apparatus for heating or warming greenhouses, which may also be used for other warming or heating purposes. A communication.

2326. C. D. Gardissal. Improvements in the manufacture of cement. A communication.

2357. T. Dugdale. An improved lubricator.

2427. W. Dray. An improved method of and apparatuses to be employed in the stacking or storing of corn and other agricultural and horticultural produce.

2485. J. F. Porter. Improvements in the manufacture of bricks and other articles of clay and brick-earth, or of the like materials.

2531. S. Russell. Improvements in the manu-

facture of tea-pot handles, knobs, door-plates, finger-plates, razor-scales, and knife-handles.

2579. J. White. Improvements in preparing for spinning cotton and other fibrous substances.

2617. R. A. Brooman. Improvements in the manufacture of cranked axles and shafts. A communication.

2863. P. Kürten. Improvements in the manufacture of mottled soap and yellow soap.

2923. H. Mollet. An improvement in fulling woven woollen fabrics.

2978. W. F. Thomas. Improvements in sewing-machines.

2984. A. V. Newton. Improvements in printing-presses. A communication.

3030. T. Dethier. An improved knife-cleaner.

3059. C. F. Varley. Improvements in electric telegraphs.

62. H. C. Hill. Improvements in screw and lifting jacks, and in machinery for lifting, pressing, and lowering.

67. E. J. Hughes. Improvements in the manufacture and application of compounds resembling gutta percha and caoutchouc from flour, fibrine, gelatine, and other vegetable and animal substances. A communication.

84. J. and C. Gratrix. Improvements in looms.

90. F. X. Kukla. Improvements in apparatus for heating stoves by gas.

98. G. F. Wilson. Improvements in treating Burmese and such like petroleum, and their products.

102. G. Eskholme and H. Wilkes. Improvements in apparatus for preventing waste of water from service pipes and cisterns.

105. J. Hinks and G. Wells. An improvement or improvements in metallic pens.

119. G. A. Blittkowski. Improvements in breech loading fire-arms.

130. M. A. Muir and J. McIlwham. Improvements in moulding or shaping metals.

135. H. H. Henson. Improvements in treating animal and vegetable fibre and fabrics for preserving and waterproofing the same.

137. G. T. Bousfield. Improvements in sewing-machines. A communication.

147. A. Steinmetz. The improvement of circular gas-burners and their chimneys (to be called the Steinmetz Burner and Steinmetz Chimney.)

180. T. Kitelee. An improved combination of ingredients to be employed as a breakfast powder, or article of diet.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1854.

201. Patrick Moir Crane.
227. John Kershaw.
234. Luther Young and Edwin Marten.
238. Louis Christian Koeffler.
240. William Wright and George Brown.
241. Pierre Joseph Meeus.
246. Claude-Bernard Adrien Chenot.
259. Joseph Beattie.
261. Adolphe Mohler.
264. James Stevens.
273. William Longmaid and John Longmaid.
279. James Boydell.
328. Henry Warner, Joseph Haywood, and William Cross.

LIST OF SEALED PATENTS.

Sealed January 27, 1857.

1881. Archibald Lockhart Reid.
1885. John Cartland.
1907. John Burns Smith.
1921. Louis Auguste Joyeux.
1930. Andrew Peddie How.
1931. Charles Marie Chouillou.
1937. Robert Jobson.
1941. William Edward Newton.
1950. Joseph Maudslay.
2151. John Buchanan.
2257. Charles Renshaw.
2341. William Nehemiah Parsson.
2417. Richard Ford Sturges.
2639. Henry Bessemer.
2707. George Pye.
2731. John Jones and Edward Jones.
2749. William Morgan.
2777. William Edward Laycock.
2788. Charles Edwin Heinke.
2796. Jacob Levi Elkin.
2861. Frederic Siemens.

Sealed January 30, 1857.

1799. Robert William Sievier.
1801. Julien Denis.
1816. Thomas Routledge.
1827. Oliver Long.
1836. George Walker and James Scrimgeour.
1838. Alexander Wright.
1846. Jean Jacques Danduran.
1870. William Gorse.
1876. Thomas Whittaker.
1900. Alfred Priest and William Woolnough.
1970. Etienne Sterlingue.
2012. John Randolph Sees.
2882. Auguste Edouard Loradoux Bellford.
2884. David Crawford.

Sealed February 3, 1857.

1834. Nicolas Cadiat.
1844. Antoine Dominique Sisco.
1848. John Keith.
1864. Coleman Defries.
1882. Edward Owen.
1887. Richard Archibald Brooman.
1897. Jean Baptiste Clara.
1925. William Edward Newton.
1927. William Edward Newton.
1939. Joseph Brouard and Joseph Hubert.
1956. Robert Kenton.
2000. Alfred Vincent Newton.
2366. George Hallen Cottam and Henry Richard Cottam.
2389. George William Varnell.
2815. James Higgin.
2897. James Perry.
2905. Richard Eaton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

A Constant Reader.—If Daniells states, as you say, that the pressure of the atmosphere at any point, varies inversely as the square of the distance of that point from the surface of the earth, there is no doubt that he makes a serious mistake. He could not have known exactly what he was saying, for if such were the case the pressure at the surface of the earth would be infinite, and this is plainly not the fact.

Webster gives the following equation as an approximate expression of the law of variation of the atmospheric pressure and temperature with the weight:

$$\text{Log}\frac{p_1}{p}=\frac{gr}{k(1+a\theta)}\cdot\frac{z}{r+z}:$$

in which p is the pressure at the point of inquiry, z the weight, θ the temperature, g the accelerating force of gravity; p_1 is the pressure at the surface of the earth, and the increment of volume for every additional degree of temperature under the same pressure, and k is the quotient of the pressure by the density when $\theta=0$.

Semiramis.—We will endeavour to find space for your suggestion respecting gas burners in an early Number.

T. P. Hollick.—We are much obliged to you for your suggestion; but as we have not space to give the evidence produced at the inquest, and as there is much doubt connected with the circumstance in question, we have necessarily deferred hitherto any remarks upon the subject.

W. T. F. M. T.—The vessel with the denser air would arrive last at the surface.

J. Hunter.—You will get no more work done, by the expansion of the compressed air to its normal volume, than was expended in compressing it.

Lionel Fortescue.—We do not think such an article was ever published in this Magazine.

J. Maddison.—We have not the address of the manufacturers you allude to.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1749.] SATURDAY, FEBRUARY 14, 1857. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

WHITE'S CORN MILL MACHINERY.

Fig. 1.

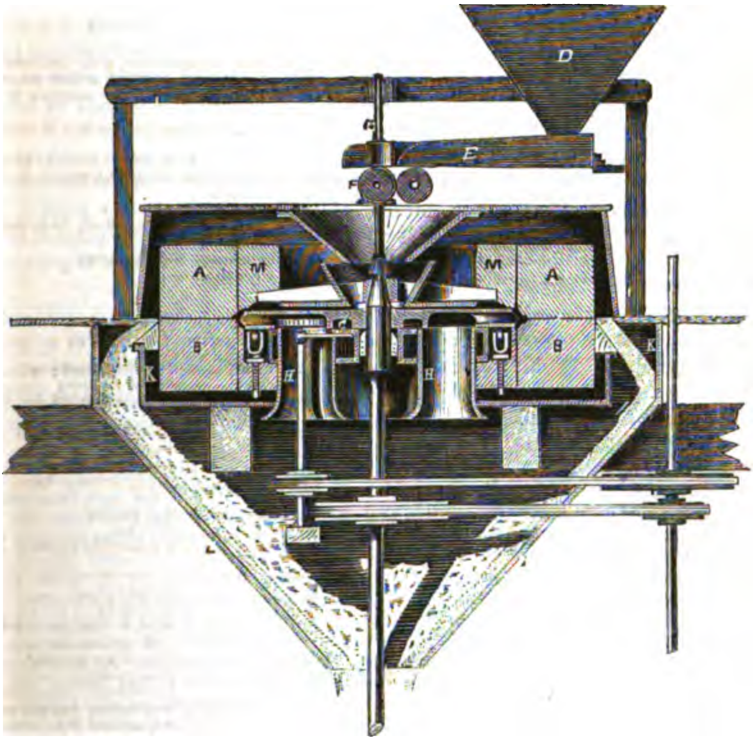


Fig. 2.

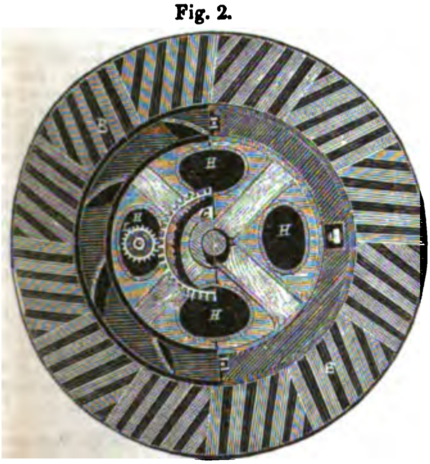
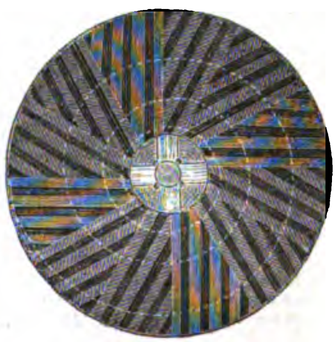


Fig. 3.



THE PERMANENT WAY OF RAILWAYS.

Two papers on the above subject were read at the Institution of Civil Engineers, February 3, 1857. The first was

ON THE VARIETIES OF PERMANENT WAY, PRACTICALLY IN USE ON RAILWAYS.

By Mr. W. Bridges Adams.

The paper commenced by stating, that the calculations of engineers, as to the strength and duration of "permanent way," had been baffled by the unforeseen increase of traffic, and that the proportions of the road to the heavy engines required to be reconsidered. It then described the principles involved—lateral and vertical strength of rails and firm joints—ample bearing surface of the rails on the sleepers, and of the sleepers on the ballast—chemical durability of the materials—the porous ballast for drainage—and the buoyant principle for boggy ground.

The importance of the depth of the rail, to prevent too great flexure under the rolling load, was then dwelt on, combined with the principle of supporting the rail, by the upper portion, as closely as possible to the surface, to prevent displacement.

The chronological sequence of the various forms of rails, was the single T, the double I, the bridge, and the contractor's rail; then the chair serving as an extended base to keep the rail from tilting sideways.

The process of fish-jointing was then considered, with regard to its effect in converting each rail into "a beam fixed at the two ends," and thus practically adding to the vertical strength. It was shown, that the strongest form of the double-headed rail, in which the shoulders formed an obtuse angle with the vertical web, was the worst form for fishing, and that the fishes were only kept tight by an intense strain on the bolts, which commonly worked loose, so that if neglected, the suspended fish joint was less perfect than an ordinary joint chair. The practice of rolling rails with squared side channels, to get better hold of the rails, was a great evil, for the edges were thus exposed to be sheared off by the action of the engine wheels. A remedy for this was shown to be practicable, by stamping the ends of the rails, whilst hot, in dies, so as to square the channels to the length of the fishes, and thus to compress the metal in the heads, and to improve its quality at that part, where it was usually the least sound. Thus the seats for the fishes would be squared indents and fac-similes. An improvement in the form of the fish itself was to roll it as an angle iron, with a horizontal rib below, which, while adding to the horizontal strength, afforded the means of securing a lighter class of bolts from getting loose, by keying them between the rails and the bevelled sides of the nuts and bolt heads. A mode of keying ordinary fish bolts was also shown, by driving thin plate wedges between the bevelled edges of adjoining bolts. A description followed of various other joints. Split rails, in two parts, breaking joint longitudinally, were then described, and also a system of wooden chairs and struts used in France.

The fishing and jointing of foot and bridge rails were then treated seriatim, and the truss joint for bridge rails, concluding the series, was described. Then followed the series of iron sleeper way.

Wrought iron way and sleepers, without timber, were then examined, beginning with Mr. G. W. Buck, in 1845, who produced a plan very similar to that introduced by Mr. W. H. Barlow, in 1849, the various sections of which were criticised. Then followed the girder rail, first propounded by Mr. Adams in 1851, and now modified and successfully tested and extending in use. A sample of this rail 7 ins. in vertical depth was shown, with angle brackets spreading to a width of 13 ins. breaking joint and bolted beneath the horizontal webs. Plans of the same kind were also exhibited, applicable to the ordinary double T rail; a rail of 65 lbs., and a bracket of 28 lbs., with bolts bearing on shoes on the external edges; the bearing surface on the ballast being equal to a cross sleeper road with the sleepers at intervals of 3 feet. These wrought iron girder rails were, practically, beams; but were sufficiently elastic to prevent destruction by blows—a quality always insisted on by Mr. Robert Stephenson. Experimental results were given; and a description of Mr. Spencer's corrugated permanent way completed the series.

Sixteen diagrams of varieties of permanent way, beginning with the stone-block system and ending with the girder rail, were exhibited, showing the various heights above the bearing surface on the ballast, from 18 ins. down to 2½ ins.

Specimens were shown of Mr. Adams' double-headed girder rail, as used on the Great Northern Railway; of the bridge and truss joint, as used on the Great Northern and Western of Ireland, the Belfast and Ballymena, the South Coast, the South Western, and other Railways; the bracket joint, as used on the Great Northern and South Western; and models of the bracket joint and intermediate brackets with two bolts, and of the mode of keying fish bolts.

The second paper read was

ON SOME RECENT IMPROVEMENTS IN THE PERMANENT WAY OF RAILWAYS.

By Mr. P. M. Parsons, Assoc. Inst., C.E.

The improvements described in this paper had reference particularly to the form of the chair and to the nature of the fastening. As laid on the East Kent Railway, the joint chairs weighed about 54 lbs. each, and, with the exception of being somewhat longer, were in general appearance similar to ordinary chairs. They were 12 ins. in length, and the sole, or bottom, was provided at the underside with a cross rib at each end, overhanging the sleeper on each side, and forming with it an inverted trough girder, of which the ribs were the webs, and the sole, or bottom of the chair, was the flange. One jaw of the chair was made to fit the shoulders of the rails, and the other was provided with two recesses, which received two thin creosoted elm blocks, cut across the grain, acting as cushions—a wrought iron wedge, provided with jags, or barbs, being driven between the rails and the wooden cushions. In the intermediate chairs, one jaw was of such a form that the upper part pressed against the web, and the lower part against the side of the table. The other jaw had an inward inclination of about one in three, and was provided with a dovetail recess, to hold the wooden cushion — a cast iron wedge being introduced between it and the rail. This wedge, instead of fitting against both shoulders of the rail, was made to bear against the web, and the upper part of its lower shoulder, by which the rail was forced down upon the seat, and was held firmly in a lateral direction. A short length of way on this system was laid in 1854, on the Great Northern Railway, under the direction of the engineer-in-chief, Mr. Cubitt, and the results were considered to be very satisfactory.

Specimens of these chairs and fastenings were exhibited, and the subject was generally fully illustrated by a large series of models furnished by the Permanent Way Company.

BOILER EXPLOSIONS, AND THE RAISING AND USE OF STEAM.

(*Concluded from p.* 103.)

(*Concluded from p.* 103.)

ON THE CONSTRUCTION OF BOILERS.

In the Manchester district, boilers of the Cornish or fluid construction, from their adaptation to a higher pressure than Waggon and Butterley boilers, have to a great extent superseded these, and though inferior in strength to plain cylindrical boilers, generally receive the preference, on account of superior economy in generating steam. The weakest point in these boilers are the flues, which, in case of deficiency of water, are very liable to collapse. It has not been satisfactorily ascertained what pressure such flues are capable of sustaining, but by some late experiments it has been proved that the strength of cylindrical vessels subjected to external pressure is in the inverse proportion to their length, a fact which seems hitherto to have been unknown, or at any rate disregarded. It seems, on this account, advisable in high pressure boilers of this construction to strengthen the internal flues, if of considerable length, by external rings of T, or angle iron, or, which would be preferable, to join the plates with flanged seams, commonly known by the name of "Adamson's patent seams." As the experiments referred to were only conducted on a small scale, it is highly desirable that further experiments should be undertaken.

The cylindrical boilers without internal flues, though well adapted to high pressure, do not contrast favourably with flued boilers, in economy of fuel. The Galloway or multiflued boilers are much approved of by many, but multitubular boilers will be found the most economical, though hitherto the necessity of frequent repairs has brought them into much disrepute. The difficulty of removing incrustation from the tubes may in most, if not in all, cases be overcome, by the use of sediment collectors, chemical ingredients, or frequent blowing off.

In regard to the evaporating power of boilers, our present knowledge is very imperfect. The true test of the merits of a boiler, is the weight of water evaporated per lb. of coal under a given pressure and in a given time, which can only be ascertained by means of an accurate water meter. Some experiments made in one of Hill's multiflued boilers, with Kennedy's water meter, give an average evaporation of 7·5 lbs. of water per lb. of ordinary Lancashire coal, under a pressure of 45 lbs. per square inch, the rate of combustion being 12·9 lbs. of coal per square foot of grate per hour, and the temperature of the feed water 82°. In the course of the present year further experiments will, it is hoped, be made.

SMOKE PREVENTION.

This subject has received considerable attention, and although the progress made in this direction is very limited, it is gratifying to find that a more perfect knowledge of the subject has had the effect of removing much of the prejudice which hitherto existed. Several examples might be adduced to prove both the possibility and advantage of smoke prevention in regard to

economy, "but the whole subject," says Mr. Longridge, "has been so thoroughly investigated and explained by Mr. Charles Wye Williams, in his Essay and Treatise on Combustion, that it is quite unnecessary for me here to enter upon it, excepting to add my testimony to the truth of the principles therein expounded."

It may be useful, however, to warn those who feel disposed to act upon Mr. Williams' suggestions, against an error into which many have fallen, in concluding that what succeeds in one boiler must necessarily succeed in all others of the same dimensions, and with the same arrangement of the flues. This does not necessarily follow, for unless in each case there be sufficient draught to bring the due proportion of atmospheric air into contact with the carbon and the gases, the combustion will be imperfect, and since, in some boilers, twice or three times as much fuel is burnt in a given time upon the same area of fire-grate as in others, it is obvious that, in the former, twice or three times as much atmospheric air will also be required. It is from inattention to these different conditions that instances of failure are heard of. The principle is unquestionably correct, and only requires to be thoroughly understood to be applied with success.

CAUSE OF BOILER EXPLOSIONS.

The majority of these explosions resulted from inattention to the supply of water.

STEAM ENGINES.

High-pressure Steam.—The economy of high-pressure steam is now generally admitted, but there appears to me to be much misapprehension as to the source of this economy. By many it is imagined that it is derived principally from its generation in the boiler. This opinion seems to have been formed from the observed fact, that the pressure increases in a rapidly-accelerating progression — in other words, the higher the pressure, the more rapid the increase. But it has been satisfactorily proved, that the quantity of fuel required to evaporate a given quantity of water increases with the pressure; that is to say, it requires more fuel to evaporate a given weight of water under 60 lbs. than under 10 lbs. pressure, from which we may conclude that no economy will result from the generation of steam at an increased pressure, unless accompanied by a proper use of it in the engine.

Of Non-condensing Engines it is only observed that, in order to work with the greatest economy, it is necessary so to arrange the valves that the steam will be reduced by expansion nearly to atmospheric pressure before escaping from the cylinder.

In *Condensing Engines* the steam should be cut off at such a portion of the stroke, that at its termination the pressure of the steam will be reduced by expansion to 8 lbs. or 10 lbs. below that of the atmosphere, previous to passing into the condenser. Otherwise the steam has not done its full work. If, therefore, it be required to expand the steam to this low pressure—say 7 lbs. total pressure—and the valve be arranged to cut off at one-fifth of the stroke, the initial pressure should be 35 lbs. or 20 lbs. above that of the atmosphere, and if 10 lbs. additional be allowed in the boiler, which is more than absolutely necessary, we have 30 lbs. per square inch, beyond which there is no advantage in raising the steam for this class of engine, cutting off at one-fifth of the stroke. We find, however, examples where the boiler pressure is nearly double this amount, while the initial pressure in the cylinder does not exceed 12 lbs. or 14 lbs. per square inch. This arises partly from the mistaken ideas above mentioned, and partly from errors in the arrangement of the valves.

In order to work more expansively and economise fuel, it is usual, where slide-valves are employed, to increase the lap or cover of the valve, that it may close earlier; but when this is done it is found that the engine will not drive its load unless the boiler pressure be increased; the explanation is, that the additional lap on the valve has so contracted the opening of the port, that the steam can only enter the cylinder at a greatly reduced pressure. By properly proportioning the lap and travel of the valve, the same result might be obtained without any increase of the boiler pressure.

Another error is, the common practice of cutting out a small piece on the steam side of the valve, in the shape of a V, to admit the steam more gradually to the cylinder, and thus prevent a sudden shock to the engine in passing the centres. To some extent this effect may be produced, but there will at the same time be the disadvantage of wiredrawing the steam, and admitting it to the cylinder when the valve ought to be entirely closed. A better remedy is the following:

So arrange the valve as to close the exhaust port before the termination of the stroke; the steam within the cylinder will then be compressed as the piston continues its course, and will increase in pressure as the space occupied is diminished. By properly proportioning the degree of compression to the initial pressure on the piston, all shock in passing the centres will be obviated, and steam economised. Wherever this has been adopted, it has given the most satisfactory results, and its adoption must eventually become general.

Compound Engines.—These remarks on the arrangement of the valves apply equally to engines working compound. This system, of late brought much into use, is found in some instances to give very satisfactory results, and where additional power is required, is frequently the most convenient mode of obtaining it; but in comparing the best engines of each system, there does not appear that decided superiority in economy in compound engines which might have been anticipated from the greater pressure of steam. The indicator diagrams show that in all engines working compound, there is a loss of pressure, as the steam passes from the high to the low-pressure cylinder, the amount varying according to the arrangement of the valves and the capacity of the passages of communication. What is chiefly required to improve the condensing engine, and make it equal in economy to the compound engine, is a simple variable expansion motion capable of regulating the supply of steam according to the load, without any reduction in the initial pressure, an evil to which most engines are now subjected by the action of the throttle valve. The present valve motions which have this for their object, appear to be too complicated to be brought into general use.

TONNAGE AND SHIPPING REGISTRATION.

To the Editor of the Mechanics' Magazine.

Sir,—In acknowledgment of your editorial article on "Tonnage and Shipping Registration" in your last Number (1747), I am quite satisfied with your new version of the admitted deficiencies of our present system of Shipping Registration as expressed by you in the following terms:

"What then are the *deficiencies* of the present law on which we are agreed? Of course we acknowledge that the present law does not require the registration of the light or load displacement of a vessel. Does not prescribe a limit of load water line. Does not require the registration of indicated horse power or any real measure of engine-power equivalent to this. We may further acknowledge, that for scientific purposes, a knowledge of these data may be of the greatest benefit, and we may further admit that it may be worthy of the consideration of a committee appointed by a scientific body of acknowledged authority whether these data can be obtained by legislation or otherwise without any injury to the shipping interest."

I cordially concur in the above your declaration as the editor of the *Mechanics' Magazine*, presuming that by the concluding words, "the shipping interest," you mean the lawful rights of all parties interested in shipping transactions. I observe further, that, notwithstanding your admissions of the deficiencies of our present system of official registration, under the law of 1854, you again advance the often-repeated challenge in support of the sufficiency of the present system, and which I have hitherto declined to notice, because, as I conceive, there ought to be no challenge of intentions. Your often repeated challenge is as follows:

"The Merchant Shipping Law of 1854 is admirable for the purposes for which it was intended."

Now the foregoing admitted deficiencies, as respects the total exclusion of external admeasurements from our present registration established the following deductions:

1st. That a vessel of a 100 tons register, and paying fiscal dues as such, may, if it suit the trading interest of parties, be so constructed as to carry 1,000 tons weight of cargo. I ask, was this anticipated and intended by the framers of the law?

2nd. A merchant may contract with a shipbuilder for a vessel of 1,000 tons register, pay the contract price, and find himself the owner of a ship so proportioned and built, with a view to speed and strength, that she will not carry 500 tons weight of cargo within any reasonable limit of load water line; such may be the case: and I ask, was this anticipated and intended by the framers of the law?

3rd. As respects the existing reality, every ship, without exception, measured and registered under the law of 1854, of say 100 tons register, is capable of holding 250 tons of goods by measurement, at the usual rate of 40 cubic feet to the ton, and yielding freight on 250 tons, though rated for fiscal dues at 100 tons only; hence, with persons who may have occasion to ship goods, and don't know better, fiscal dues to the extent of say *5s.* per ton, charged on the ship, may be expected to enhance the cost of freight *5s.* per ton, and the stipulated rate of freight may be agreed for under this impression, though in reality *5s.* per ton on the ship would be met by *2s.* per ton measurement on the cargo. Again, I ask, was this liability to surcharge anticipated and guarded against, or intended, by the framers of the law? In like manner, and from the same cause, other questionable operations of the law may be cited, all which would be obviated by our shipping registration embracing not only the capacity of ships for holding bulk of cargo, but also their capability for carrying weight of cargo, and a distinctive nomenclature being introduced into our system of registration.

As to the above cited cases, I do not say there would be anything commercially unjustifiable in thus taking advantage of the admitted deficiencies of our registration; and in late numbers of the *Mechanics' Magazine*, the sentiment has been repeatedly advanced as a moral axiom, that one who can be deluded by any uncertainty in the term "Tonnage," deserves no more protection from Parliament than the simpleton in any other trade, who chooses to buy a "pig in a poke." Again I ask, was the propagation of such morality as this anticipated and intended by the framers of the law which regulates our shipping registration?

It is evident that advantage may be taken in each of the various cases of tonnage anomaly above specifically cited, and as respects these possible instances of shipcraft, instead of concurring in your declaration, that "the Merchant Shipping Law of 1854, is admirable for the purposes for which it was intended," permit me to say, that the law is lamentably open to be made use of for the purposes above set forth, and that such purposes, if acted upon, constitute public abuses, which have not been anticipated, guarded against, or intended by the framers of the law, and which cannot be permanently upheld.

I am, Sir, yours, &c.,
CHARLES ATHERTON.

[WE preface the remarks we shall offer on the above letter by the announcement that we must here close the controversy that has arisen on Shipping Registration between Mr. Atherton and ourselves. Our pages have been open to this gentleman to the very utmost extent that justice or courtesy can demand. The question has been well ventilated, and we know no useful object that can be gained by pursuing further a discussion which must have become wearying to our readers.

With respect to the letter itself, we must observe, that every deficiency is not necessarily a defect; and although it may be desirable that some deficiencies should be supplied, it may well be that this cannot be effected without the admission of concomitant evils which would more than compensate for the advantages gained. We therefore repeat that, although for scientific purposes certain data would be very desirable, it has not yet been established that it would be advisable to supply those data by the agency of legislative enactment. We have on a former occasion defined the point at which the interference of Government in commercial affairs should cease. It is the duty of Government to take care that no injustice should be done to the public by the immunities of any particular class, and that the incidence of tolls and dues peculiar to a particular class should be as fair as possible; but it is not the duty of government to hamper the freedom of trade by the exercise of unnecessary and vexatious control, under the pretence of protecting the unwary from the machinations of the crafty, or any other pretence whatever. Interference of this kind may be well enough calculated for the meridian of St. Petersburg, Vienna, or Naples; but in the meridian of London, where the advantages to commerce of placing private enterprise under as few checks as the welfare of the whole body politic will admit, have been so long and so beneficially experienced, we do not anticipate much favour for the proposal to extend the mantle of special protection over individual members of a class by direct interference, unless a very clear case has been made out for its necessity or its justice. Has Mr. Atherton made out such a case? Has he shown that the Mercantile Shipping Act of 1854 is fairly chargeable with the abuses with which he has charged it? We believe not.

Mr. Atherton excuses himself for not having before accepted our challenge in support of the sufficiency of the present law for certain purposes by the oracular dictum, that "there ought to be no challenge of intentions." There is a sense in which this is right enough. When an individual takes a certain part, or espouses a certain cause, we admit "that a challenge of his intentions" in so doing, is generally very much to be deprecated, and is often resorted to for want of more cogent arguments. But surely the inquiry into the intentions of a law does not come under this head. The Judges of the superior Courts are employed every day in inquiring into the intentions of the Legislature in passing various enactments, in order to fix the sense of those parts which may be obscure, by the general scope and tendency of the whole. We cannot conceive that any person can have an adequate idea of the meaning of any law until he has clearly set before his mind's eye the intention with which it was proposed and passed. On the contrary, it seems to us that the first questions which a man should ask himself with regard to a law are, what objects was it intended to secure, and are its several enactments efficient for this end? Then he will be in a situation to ask, Are there other and different objects which it ought to have been the intention of the Legislature to secure, and if so, were these omitted advisedly or inadvertently? These points must be settled before the inquirer can reasonably determine whether these other objects can be fitly obtained by legislative enactment; and if so, whether, to secure them, it will

be necessary to alter the existing law, or merely to add to it. The knowledge of the intention of a law, then, is a *sine quâ non* to the right appreciation of it.

We repeat, therefore, with no invidious "challenging of intentions," that the one object which the registration clauses were meant to secure was, the impartial and fair incidence of tolls on all merchant ships. This object, we assert, the law attains as far as can reasonably be expected, and this Mr. Atherton denies. In support of his case, he advances three several deductions which, he asserts, the "admitted deficiencies" of the law establish. These are—1. That a vessel of 100 registered tonnage may be so constructed as to carry 1,000 tons weight of cargo. 2. That a vessel of 1,000 registered tons may be so constructed as not to be able to carry more than 500 tons weight of cargo. 3. (which seems a little inconsistent with the two former allegations) that as "every ship, *without exception*, measured and registered under the present law, can carry 250 tons weight for every 100 tons register, unwary persons *may* be called on to *pay 5s.* per ton on the score of light dues, &c., on the goods they ship, whereas the equitable charge should be no more than 2s. per ton.

The first thing that strikes us in these allegations is, that they all three deal with merely hypothetical cases. Mr. Atherton does not venture to tell us that such ships as he instances *ever have been* built, or are ever *likely to be built;* in fact, his third assertion quite disposes of the question of fact. It is very possible that in these oracular cases he may have in view another choice example of "*Reductio ad Tub.*" If so, we wish him joy of it—much good may it do him! We assert, on the contrary, that so long as ships are intended to conform to the ordinary conditions of ships—to float upon the sea without toppling over the moment they reach their natural element—to encounter storms—to fetch and carry a reasonable amount of cargo in a reasonable time—there must be a proportion between the portion of the ship out of the water and that immersed, varying within tolerably narrow limits. There cannot be an undue amount of top-hamper without destroying its commercial value; and it is, therefore, only reasonable to expect that ships will go on being built capable of carrying, on the average, 250 tons weight for every 100 tons register, rather than 1,000* tons, or only 50 tons. Practical men will smile at the idea of being asked to alter the law to meet the case of tubs or arrows! Mr. Atherton is *so very scientific* that he cannot acquit a law of injustice and murder, unless it makes provision for vessels which all laws of science and all deductions of experience would condemn as being no ships at all; which no shipbuilder would be so crazy as to construct, and no shipowner such an idiot as to buy! Unfortunately for him, Government and Parliament are in the habit of looking upon questions on which legislation is demanded in a *practical* light; and so long as the shipping interests are satisfied with the "reasonable fairness" of the present law, and so long as shipowners and shipbuilders are agreed to build "*ships*"—and not tubs and other monstro-

* Our readers will perceive that we refute Mr. Atherton by the aid of his own figures. There is, however, a monstrous fallacy and confusion of terms running through his whole argument, which ought to be exposed.

A vessel of 100 tons register has an internal capacity of 10,000 cubic feet; 250 tons measurement, at the usual rate of 40 cubic feet to the ton, will exactly occupy the space of 10,000 cubic feet. Hence, Mr. Atherton tells us that *every* vessel of 100 tons register will "*hold*" 250 tons measurement of goods; which, no doubt, by filling up every nook and corner of covered-in space it could be made to do. The unwary reader would be apt to imagine that Mr. Atherton meant that the vessel could be put to sea, and perform its voyages, with this amount of goods on board; that is, with no possible place to house master, mate, or crew! He overlooks, too, the small consideration that every vessel—we might almost say without exception— would at once sink with such a load on board. Mr. Atherton has, however, saved himself by using the word "hold" instead of "carry," and has thus doubtless satisfied the argumentative "morality" of the case.

The whole argument in his third objection is based on the fallacy that every ship can "carry" 2½ tons measurement for every ton register; and our readers will consequently have no difficulty in assigning it its proper value, independently of our remarks in the text. This third case is made to contrast with the two cases on which his first objections are raised. In fairness, then, he ought to have applied to them the same conditions. Does he do this? Far from it; he speaks of the "carrying" power of these, while he speaks of the "holding" power of the former. Vessels of 100 and 1,000 registered tons will hold respectively 10,000 and 100,000 cubic feet; that is, at the usual rate, 250 and 2,500 tons measurement of goods, and neither more nor less. What they may safely carry, as well as what every ship "as regards the existing reality," may carry in proportion to its register, is a very different question. Mr. Atherton, whether intentionally or unintentionally, suppresses this distinction between the words "carry" and "hold," which, as we have seen, is most material to the argument, and which the unwary are very likely to overlook—a sad slip in a gentleman whose moral sense is so sensitive as Mr. Atherton's is! We make no comment on the extravagance of the statement that a vessel, whatever be its build, whose internal measured space (including, as the present law does, all covered-in spaces on deck) amounting to but 10,000 cubic feet, can carry goods which, at the usual rate, would occupy a space of 100,000 cubic feet, even supposing it a steamer, and allowing that its holding power (an extreme assumption) may be increased by one half, that is, to 15,000 cubic feet! Mr. Atherton surely forgets that our pages are open to the perusal of *practical* men.—Ed. M. M.

sities, which could only result in disappointment to the customer and a bad name and consequent ruin to the builder—we fear they will hardly discover in the cases instanced by Mr. Atherton "public abuses" which it is their imperative duty to put down.

With regard to Mr. Atherton's third allegation, that the unwary shipper of goods may be made to pay 3s. more per ton than he ought on the plea of dues, we can hardly think he is in earnest in urging this as an objection to the law. Of course the shipowner must take the dues into his calculation, together with all other expenses, in determining the freight per ton which he must charge on goods. We poor simple folk have been in the habit of thinking that the price of freight is very much like other prices—that of corn, for example—regulated by the demand and supply, and by the quality of the article. We had imagined in our ignorance that, in the city, the price per ton of freight was as well known, and subject to the same kind of conditions, as the prices of wheat, barley, and oats, in Mark-lane! We were not aware that when a merchant applied to an owner to ship goods, he was informed the price of carriage is so much, but I must charge you so much additional for light and other dues! Mr. Atherton may be in possession of information on this point, to which we have no access, and which might correct our ignorance. If so, we beseech him, for pity's sake, to produce it. Do not let us go on all our life under the absurdly ignorant notion that, whereas the farmer does not say to the corn-factor, My wheat is 60s. a quarter, but then I pay a tithe-rent charge of so much an acre, on 150 acres, I must, therefore, charge you 3s. a quarter beyond the professed market price; so neither does the shipowner charge so much per ton freight, and make extra charges for specific outgoings. It really would be a charity to let us know that such vulgar notions as demand and supply, in conjunction with prime cost and the aggregate outgoings, are not the only things which regulate the cost of carriage of goods on shipboard.

Further, the divisor 100 was not, as Mr. Atherton seems to suppose, adopted arbitrarily, but to fulfil a condition which the shipping interest considered a *sine quâ non* in any system of registration, viz., to make the total amount of the registered tonnage of British shipping the same, at the time of passing the Act, by the new as by the old measurement, in order that British shipping might not be placed at a disadvantage, compared with foreign shipping, with regard to dues. It seems difficult to cavil at the reasonableness of this limitation. Something equivalent to the present registered tonnage, that is, a measurement reduced by a suitable divisor, must be registered for this purpose, under any system; even should that system embrace the registration of capability of carrying tons weight. If the persons shipping goods, "who don't know better," are now liable to be imposed upon, we do not see how the registration of capability of weight would help them; for, if they are as ignorant as Mr. Atherton supposes, it is not likely that they should know on which of the registered "capabilities" dues are to be levied.

Finally, Mr. Atherton addresses himself to the morality of the question; and he quotes a passage from Dr. Woolley's letter (for which we are no further responsible than as having given it a rather prominent place in one of our recent numbers) to the effect that, one who can be deluded by any uncertainty in the term "tonnage," deserves no more protection from Parliament than the simpleton in any other trade, who chooses "to buy a pig in a poke;" which sentiment he tells us has been repeatedly advanced in late numbers of the *Mechanics' Magazine;* and then, in a triumphant tone of indignation, he says, "Again, I ask, was the propagation of such morality as this anticipated and intended by the framers of the law which regulates our shipping registration?" We are not aware of the repeated inculcation of this sentiment in our later pages, nor do we recollect having offered any remark that bears any resemblance to it since our first series of articles in April. What we then said we do not repudiate, even though we subject ourselves, in consequence, to the withering blight of Mr. Atherton's indignation. Mr. Atherton is great, as we have seen, in many things—he is great in figures—he is great in imagination—he is great in science—he is great in political economy, and questions of supply and demand—but what he is greatest in is—morality. His moral sense is so largely developed, that a poor unfortunate mortal who unwittingly excites it, finds himself overwhelmed with withering sarcasm. Our readers cannot have forgotten how, in January 1856, after exposing the "deficiencies of the present law," and laying to its charge all the horrors we have frequently mentioned, his moral sense carried him, *sublimi pennâ*, upon that furious onslaught on vested interests—from the Archbishop of Canterbury and the Lord Chancellor down to the farmer who *would* have protection, and the shipping interests that *would not*—which ultimately reduced him to the unpleasant necessity of offering

something very like an apology to the latter. After all the bitter things that he has said of the law of 1854, we must not be very much surprised at the imputation on ourselves of inculcating bad morality.

Our bad morality amounts to this—that we are willing to leave the transactions between merchants, shipowners, and shipbuilders, to the ordinary conditions which regulate other branches of trade. The corn merchant at Mark-lane is not aided by a government officer in judging of the quality of the several grains he finds exposed there for sale: his own knowledge of his business and experience are the guides on which he must exclusively rely. Nor is the dealer in iron protected against the iron-master by having the assistance of a government official, or government rules in determining the quality of the samples offered to his notice. So of other trades. We have ventured to express our opinion that the buyer does not stand in more need of special government protection against the seller in the case of ships than in other branches of business. There must be something to be learnt in every trade; and if Dr. Woolley means—as we suppose he does—that a merchant who is liable to imposition by reason of his being misled by the term "tonnage," has not capacity enough to insure him against imposition, however much Government may protect him, we think he is not far from the mark. Are British merchants generally so little alive to their own interests, so liable to be deceived, so ignorant of their business, that they cannot be trusted to run alone without being tied by the leading strings of government, which must step in at every turn to keep them from going astray and ruining themselves? Yet, this is the head and front of our offending against morality. We resign ourselves to the merchants of Great Britain to inflict whatever penalty on us they may think fit.

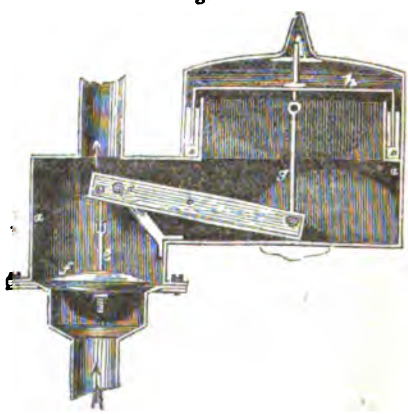
Is it possible that in these three allegations lies the gravamen of Mr. Atherton's charge against the Merchant Shipping Act; that all that can be brought against it consists in three hypothetical cases, which are all either contrary to the nature of things, or inconsistent with the conditions of trade? Can it be on these grounds that he clamours for its repeal? In that case, he must be a sanguine man indeed to hope for success in his present raid.—Ed. M. M.]

YOUNG'S GAS REGULATORS.

The following is a description of the gas regulators of Mr. Luther Young (of Bow-lane, Cheapside, London), fifty of which have been supplied to the Government Department, at Woolwich.

The object of the invention is to facilitate the dip of the floating drum of gas regulators into the mercurial joint. In order to effect this, Mr. Young provides a counterpoise to the resistance which the mercury offers to the descending drum, by making the rod or lever which connects the floating drum with the regulating valve hollow, and inserting therein mercury or its equivalent, which, as the ascending current of gas lifts the valve from its seat, will cause the hollow rod or lever to rock, and the mercury to flow towards the depressed end. The mercury, by thus accumulating at one end of the hollow connecting lever, will virtually increase the weight of the floating drum, and thus enable it to overcome more easily the resistance which the mercurial joint creates to the downward movement of the drum. Or, instead of this arrangement, he puts the mercury that is to form the counterpoise in a vibrating tube or tubes mounted above the drum, which will have the same effect in overcoming the resistance caused by the mercurial joint, by pressing down the drum instead of drawing it down, as above described.

Fig. 1.



In the accompanying engravings, fig. 1 represents the first of these modes of applying the invention to a gas regulator, the latter being shown in longitudinal sectional elevation. *a*, *a*, is the outer casing; and *b* is an annular trough in which the mercury is placed to form the mercurial joint; *c* is a hollow lever, which rocks on the fulcrum *d*, and is connected at one end by means of

a link, *e*, to the inlet valve, *f*, and at the other end by a rod, *g*, to the floating drum, *h*, from the centre of which the rod depends. Within the hollow rocking lever the mercury for forming the counterpoise is placed, it being free to run from end to end, according to the motion of the lever. As the pressure of gas increases in the casing, *a*, the drum, *h*, is caused to rise, and, by means of the lever and rods, *c*, *e*, and *g*, to depress the valve, *f*, and thereby contract the passage for the supply of gas to the burners. On the pressure of the gas decreasing, the floating drum will sink by its own gravity, and the fluid counterpoise, at the same time accumulating towards that end of the lever to which the drum is attached, will counteract the buoyant tendency of the mercury joint, and thus render the drum far more sensitive than heretofore to changes in the pressure of the gas passing through the gas regulator.

Fig. 2.

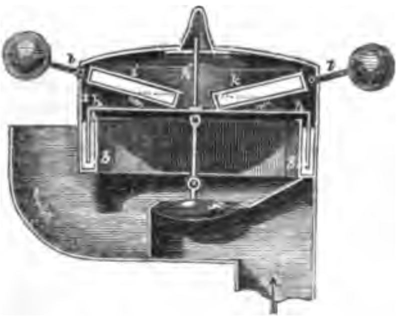


Fig. 2 shows, in longitudinal sectional elevation, the modified arrangement above indicated for effecting the like object to the apparatus just described. In this example two hollow levers, *i*, *k*, are employed for pressing instead of drawing down the floating drum; these levers have their fulcra at *l*, *l*, and they are provided with balance weights at their outer ends, their hollow part or that within the casing being charged like the lever, *c*, fig. 1, with mercury, for overcoming the buoyancy of the floating drum, *h*, *h*. In this arrangement the supply valve, *f*, is connected directly with the drum, and the steady up and down motion of the drum is insured by a guide rod, *h'*, which it carries, entering a guide formed for it in the top of the casing. When the pressure of gas increases within the casing, *a*, it causes the drum, *h*, to rise and carry up the valve, *f*, and thereby contract the inlet passage and reduce the supply of gas to the burners, as in the former instance. As the pressure decreases within the casing, *a*, the drum gradually descends and again opens the valve, *f*, the drum being assisted in overcoming the resistance of the mercury within the trough by the levers, *i* and *k*, pressing upon its upper surface, as shown.

DAFT'S IMPROVEMENTS IN CAST IRON PIPES.

Mr. T. Barnabas Daft, of Dublin, has just filed the specification of a patent for an invention which has for its object the forming of spigot and faucet ends upon cast iron pipes, true enough to make "metal to metal" joints without turning and boring. Chills or iron moulds are made of suitable dimensions and angles, to form a spigot at one end, and a faucet at the other end, of cast iron pipes. They are placed upon the pipe pattern, and moulded therewith, and when the pattern is removed from the sand, the spigot and faucet chills are to be returned to their respective places, and the metal being poured into the mould, a pipe is cast with a spigot at one end, and a faucet at the other. This mould, if the pipe were broken to allow of them being brought together, would accurately fit "metal to metal." Consequently, were a number of such pipes to be made, they would fit spigot into faucet in a continuous manner, and the accuracy of this joint is found to be such that by simply wetting the surfaces to be united, and driving them home, they rust up in a few days, and form a perfectly steam tight joint, requiring several hundred pounds' pressure on the inch to separate them. But generally the joints for gas and water purposes may be made by applying a luting of red lead or other suitable material, and, in some cases, tar will be found to form a sound and durable joint.

BIG BEN.

(*From the "Builder."*)

In the section of the Westminster clock-tower, given in your number of last week, Big Ben is shown suspended in the most sensible way possible, that is, by a single bolt passed through his central boss. Permit me to suggest, that a suitable number of small spherical rollers be introduced between the collar of the bolt and the inside of the crown: the rollers may be kept equidistant, by a simple carriage made to receive their axes. Key a ring of teeth, or wheel, on to the flanch of the boss on the top of the bell: attach a screw or worm (gearing into the ring of teeth, and furnished with a capstan head) on to the under side of the beam from which the bell is suspended; then a man standing on a suitable platform

will, with a lever, easily work the capstan and turn the bell. The rollers will greatly reduce the friction, and, consequently the labour of turning, and also the objectionable twist on the central bolt. The object of turning a bell is now too well known to need explanation.

The screw may be inclined in order to suit a wheel cast with straight teeth. A precedent for this will be seen in Messrs. Maudslay and Field's patent disconnecting apparatus for paddle wheels, which has been successfully used for many years in government steam ships.

W. L. Baker, C.E.

Laxton's Builders' Price Book for 1857; containing upwards of 8,000 Prices, carefully corrected from the present Price of Materials and Labour, 3,000 Useful and Important Memoranda; together with Tables for Purchasing Leases, Estates and Annuities; Areas and Circumferences of Circles, Scantlings of Timber, Weights of Iron, Timber, &c. By William Laxton, Architect. *And the whole of the Metropolis Buildings Act, with Notes of Cases, the Unrepealed Section of 8th Vict., c. 84, and List of District Surveyors.* Thirty-fourth Edition. By Frederick W. Laxton, Barrister-at-Law, F.S.A. London: John Knott, Civil Engineer and Architects' Journal-office, 19, Arundel-street, Strand.

The title-page of this work, given above, is fully sufficient to indicate its contents, and its merits in the previous editions are so well known, that we need say but little in its praise. It is only proper, however, to remark, that in the first part, descriptions and prices of numerous novel building materials, patented or otherwise, are given, and that the notes on the Metropolitan Building Act, in the second part, are of a sound and useful character.

STEAM SHIP ARITHMETIC.

To the Editor of the Mechanics' Magazine.

Sir,—It is but right towards you that I at least endeavour to make intelligible the communications from myself which you have been pleased to present to the readers of the *Mechanics' Magazine*. In reply, therefore, to "Mechanic," who admits that he is quite familiar with the well-known formula which I have adopted, as producing a co-efficient, which I have called the "Co-efficient, or Index Number of Dynamic *Duty* of Steam Ships," but still cannot conceive what I mean by the expression, "dynamic duty," I will now, in addition to my former remarks, in No. 1747, explain that this co-efficient does not directly indicate the gross amount of work that a ship may have performed, or is capable of performing, or anything proportional thereto; but it comparatively indicates the working condition, constructive adaptation, fitness, efficiency or inefficiency of the means employed with reference to the effects produced. Analogously, in speaking of the efficiency of Cornish pumping engines, we may say that one engine performs ninety millions duty, another eighty millions duty, and another only sixty millions duty. These expressions have nothing to do with the actual size of the respective engines, nor do they describe the gross amount of work actually performed in any given time; but they describe the comparative efficiency or excellence of the engines as respects the ratio of coals consumed and effects produced. In like manner the co-efficient or index number deduced from the rule "Multiply the cube of the speed by the cube root of the square of the displacement, and divide by the indicated horse power," is an exponent of the comparative efficiency of the steamers which may be so subjected to test trials, and this resultant test of merit is totally irrespective of the size of the ships themselves; and if the consumption of coals per hour be substituted in the formula for the power, the management and efficiency of the boiler department will also be called in question. The neglect of all tests of dynamic duty, such as that afforded by the co-efficient or index number deduced from the formula referred to has ruined many a steam ship enterprise, through the employment of highly loaded vessels that ought not to have been sent to sea; and if not ruined, the public have had to pay the cost. This subject was pointedly brought forward in my paper, read before the British Association, in August last; and it involves considerations of the highest public importance.

As respects the comparative carrying powers of large and small vessels, of which the co-efficients or index numbers are equal, it is literally true that a vessel of eight times the displacement of another would require only four times the power to attain a given speed. I have not stated that such two vessels would be equally economical, though of equal dynamic merit; but, on the contrary, "Mechanic" will find this matter also fully exemplified in Table L., page 84, and also in the Appendix to "Steam Ship Capability," second edition, "on the capabilities of the large class of ocean steamers, as compared with vessels of ordinary size;" and even though "Mechanic" persists, as he states he has hitherto done, in "declining to undergo the discipline afforded by the perusal of Mr. Atherton's *first* essays on this subject," and commencing with my last communication, prefers to read the *Mecha-*

nics' Magazine, from No. 1747, backwards, I may still hope that the mystification of which he complains will, as he reads back, gradually become less, and ultimately cease.

I am, Sir, yours, &c.,
CHARLES ATHERTON.
Woolwich Dockyard, Feb. 9, 1857.

ON SUPERHEATING STEAM.

To the Editor of the Mechanics' Magazine.

SIR,—I notice, with satisfaction, that some progress is making in the introduction of superheated steam, having myself long ago successfully practised it by the application of the heat from the fuel, unexhausted after vaporising the water. It would seem probable that the system may shortly pass into the competing hands of the makers of steam engines, without which condition there would be little hope for it even now; for these gentlemen (and not without valid reasons in these pushing times) would as soon see a certain person from another place, not very unlike it in our imaginations, as a fuel-saver in their stoke hole. Nay, if he did not keep a sharp eye about him, especially if of small stature—for all inventors are not great men—a stalwart and facetious stoker might, in his animosity, attempt to make him the illustrator of his nostrum in his own proper person, by essaying to pitch him into one of the furnaces, which he would fain do with as little compunction as he would a coal-trimmer's jacket, or even one of the smoke-consuming fraternity.

I am not one of those who entertain the expectation of deriving a great saving of fuel from the mere act, apart from other considerations, of superheating steam; or of making it clear that such saving would arise if we could remove the whole of the water from the boiler, and apply the heating power to the steam only. And it is obvious that only so much saving, or even a portion of it, as is tantamount to the loss now existing, can be obtained from the heat unexpended after leaving the water surfaces. Yet, notwithstanding this acceptation, I have actively and continuously been witness, in several steam vessels, of the advantages derived from the use of superheated steam. The engines in these vessels were, at first starting, and for some time afterwards, under their speed by several strokes, the superheating being essential to their efficacy; while as the cylinders gradually arrived at the temperature of the superheated steam, a corresponding increase of effect ensued; and after an hour or two, and often more, all was alive, as we used to term it, and the due number of revolutions reached, and with an improvement, too, of the condenser vacuum. The temperature in these instances to which the superheating was carried was generally about 350° Fahr., the pressure only 8 to 10 lbs. per square inch, the steam worked expansively at ready adjustment, and the vacuum 26 to 28 ins. This tardiness of resultant effect was, however, obviated by heating the jacket and by induction the cylinder itself, in an engine of ten horse power, by Tredgold's lever (a safe test of what one was about), constructed at these works, to verify a new process of vaporisation, (much of the intention of this having been supplanted by the subsequent introduction of tubular boilers,) of superheating the steam, and of condensation by the reinjection of the same water. This engine was some time ago removed, to make way for enlargements in the factory, having fulfilled its requirements; for a man cannot always be living upon experiments. I have, however, often regretted its demolition. It was an exemplification of the patents I obtained, embracing these inventions, and afterwards more largely applied.

Since the time of Mr. Watt's champion improvement in the steam engine, by condensation in a vessel separate from the cylinder, it had been assumed that nothing more remained to be examined or developed in this regard. Let us see if there may not be one hidden agency that perchance has escaped even the lynx eye of that scrutinizing artisan, and the apprehension of other experimentalists and engineers. Let us go to the cylinder and condenser as left by him, and in practical operation. On the plenum side of the piston we have water-saturated steam pressing forward from the boiler at a temperature due only to its density, and bringing with it a quantity of uncombined water also, every smallest diminution of temperature causing an immediate deposit of water within the cylinder. When the stroke of the piston has been made, and a free passage is opened to the condenser, this water boils rapidly off, imbibing the great latent heat due to a rare vapour under the existing vacuum, kept up too by the large exhaust pump; and if a new supply of steam did not presently follow, the cylinder and adjuncts would rapidly fall to about 80° Fahr. But by continued action, a compromise is brought about, under which the steam is always acting in the cylinder, causing a very great deterioration of effect and loss of heat. But by giving to the steam a sufficient surcharge of caloric to enable it to maintain its elastic or vaporous condition, throughout the stroke without the deposit of water, such effect cannot, of course, take place, but only a refrigeration that would arise by the discharge of so much heated air. The same holds, but

greatly moderated, in high-pressure engines.

Now, if the steam engineer would apply a thermometric indicator of instant action, which might not be difficult to obtain or devise, and employ it under the conditions of dense steam, superheated steam, and various rates of expansion and of temperature in the condenser, having a due regard to the chemistry of his machine, he would, I believe, here at least (and secure from the intrusion of patentees) discover a secret or two, touching the consumption of fuel, *well worth knowing*.

I am, Sir, yours, &c.,
THOMAS HOWARD.

King and Queen Iron Works,
Rotherhife, Feb. 7, 1857.

DRESSING SILKS.

To the Editor of the Mechanics' Magazine.

SIR,—In the list of patents recently filed, and described in the *Mechanics' Magazine* for January 17, I find one obtained by Mr. J. Perinaud for dressing silks, by brushing them over a heated surface. This plan has been known many years; although not hitherto very generally adopted. The first apparatus I saw used for this purpose, had been brought from New York. This was nearly twenty years ago; and I then thought that it was susceptible of considerable improvement. I subsequently made several experiments with that object in view, and during the last three years I have erected several machines of this kind in Lancashire and Cheshire. They are all in successful operation. It is therefore clear to me, that the patent cannot be sustained.

I am, Sir, yours, &c.,
JOHN DE LA HAYE.

12, Blackburn-street, Liverpool,
February 7, 1857.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

AVERY, D. *Improvements in the construction of bonnets and other coverings for the head.* Dated June 2, 1856. (No. 1307.)

This consists in dispensing with the ordinary stiff wiry shape employed in bonnets, and thus rendering them easy and flexible, and capable of being compressed without injury.

NASMYTH, J., and J. BROWN. *Improvements in apparatus for the manufacture of tin plates.* Dated June 2, 1856. (No. 1308.)

This consists in driving the rolls through which the plates are passed at different surface speeds; or in the employment of rolls of different diameters driven at the same speed.

MARSDEN, E. *Improvements in implements for pulverizing and cleansing land.* Dated June 2, 1856. (No. 1310.)

The improved implements take up, pulverize, and cleanse land at one operation. They first take up a certain breadth of land upon a share, then bring to bear thereon mauls or rollers to pulverize or reduce it. The land next passes between rollers, and again between other rollers or drums with teeth, in order thoroughly to disintegrate it, and remove twitch, weeds, or roots therefrom, these being carried by a belt into a receiver. As the twitch is removed the machine takes up all stones above a certain size, which are either deposited in a receiver, or thrown back upon the land, as required.

WILLETT, T. W. *Improvements in the manufacture of gunpowder.* Dated June 3, 1856. (No. 1313.)

1. A jet or jets of steam are directly applied to the charge of powder while in the mill, by which the charge is more regularly moistened than by water. 2. An artificial current of air is applied to the interior of an incorporating gunpowder mill, for drying the charge.

MACKELCAN, G. J. *Improvements in the manufacture of rollers adapted to calico and other printing.* Dated June 3, 1856. (No. 1314.)

A shell or tube of metal, or other metallic alloy, adapted to be engraved or embossed, is fixed on a simple metallic cylinder, by the intervention of tin, zinc, or solder, which, together with the contraction of the shell, connects the surfaces.

HEYWOOD, E., and T. O. DIXON. *Improvements in the means of attaching drawer and other knobs or handles.* Dated June 3, 1856. (No. 1315.)

The knob or handle is formed with a screw in place of the screwed pin now used, and the pin is formed separate, and so as to be passed through from the opposite side of the drawer (or other article) and into the knob.

WESSEL, C. R., and F. X. KUKLA. *A vapourless glow-heat disseminator.* Dated June 3, 1856. (No. 1316.)

For accounts of this invention see *Mechanics' Magazine*, vol. lxv., pp. 486, 588, Nos. 1737 and 1741.

BAUZEMONT, J. *Improvements in purifying turpentine.* Dated June 3, 1856. (No. 1317.)

First, Turpentine of commerce is purified by distilling together—1. Spirit of ordinary turpentine, 40 lbs. (avoirdupois); 2. Vegetable coal pulverised, 2 lbs.; 3. Sainfoin straw paper, or any analogous substance 2 lbs.;

4. Pure water 2 lbs. Secondly, The purified turpentine is mixed immediately after distillation with ether, and adapted for cleaning cloths and stuffs, &c.

JOHNSON, J. H. *Improvements in oil-cans employed in lubricating machinery.* (A communication.). Dated June 3, 1856. (No. 1318.)

Lubricating oil cans have adapted to them a piston in the interior, so that suitable portions of oil may be forced out by the gullet of the can, or the further egress of oil prevented.

FLETCHER, R. and E. *Improvements in sweeping chimneys or other flues.* Dated June 3, 1856. (No. 1321.)

A pulley is fixed on the top of a chimney or flue, and to it is appended a chain which descends to the fire-grate, and on which are placed two hooks carrying another small chain, in which is inserted a brush.

LEVERSON, M. R. *Improvements in tackle blocks.* (A communication.) Dated June 3, 1856. (No. 1322.)

The hooks of the lower blocks of each set of boat-lowering tackles are hung upon pivots, placed eccentrically, and are provided with counterbalance weights, by which they are detached at the moment the boat is supported by the water.

BRIGGS, J. *Improvements in blocks and bricks for building.* Dated June 4, 1856. (No. 1324.)

The parts of blocks and bricks for building, whether of wood, stone, or other substance, are constructed in various corresponding forms, and so that each has apertures into which may be inserted rods, bars, pins, ties, or bolts, so as to hold them together.

MORRIS, T. *An improved trap for beetles and other insects.* Dated June 4, 1856. (No. 1325.)

This trap consists of a frame of tubular iron. There are two bars connected to the handle, to the lower of which is attached to a shallow piece of sacking (canvas, or other light material), and a bar is placed across the centre, to which and at each end are suspended pieces of sacking, which act as curtains. The top of the frame is covered with sacking, the under side of which is smeared over with an adhesive chemical preparation, having for its object the removal or destruction of insects, as the apparatus is wheeled either upon the ridges or the surface of turnip fields, &c.

GATTY, F. A. *An instrument to be used in lighting and holding matches or vesta lights.* Dated June 4, 1856. (No. 1326.)

This is a small tube, into which the match or vesta light is put, and which is provided with a small ram or piston for pushing out the match or vesta light while burning.

POTTS, W. *Improvements in sepulchral monuments.* Dated June 4, 1856. (No. 1328.)

Covers for tombs or graves are formed with recesses or projections to receive the inscription frames at the centres of the covers, and with flanges below the level of the bases or ground lines of the covers, to preserve the level if the grave itself sinks. Inscription plates are also composed in loose pieces, so that a new record of a death may be readily affixed.

WIGLEY, R. B. *A new or improved method of attaching handles to coffins.* Dated June 4, 1856. (No. 1329.)

The knobs or buttons in which the handle turns are formed without shanks, and a screw is passed from the interior of the coffin through a hole, which screw takes into a concave screw formed in the knob or button.

HATTON, E. *Improvements in the manufacture of plain and ornamental metallic tubes.* Dated June 4, 1856. (No. 1330.)

This consists of certain machinery which cannot be described without illustrations.

MORRISON, D. *Improvements in the manufacture of metallic bedsteads and other articles to sit or recline on.* Dated June 4, 1856. (No. 1331.)

1. In constructing the stretchers of metal bedsteads, blocks are forced against the edges of the angle irons which are to be kept apart, which blocks are connected together by a bent metal bar, on the ends of which nuts work behind the blocks, so as to force them apart. 2. In forming the ornaments of metal bedsteads, &c., metal is deposited from a solution on to a suitable form.

MORRISON, D. *Improvements in the manufacture of articles from malleable cast-iron.* Dated June 4, 1856. (No. 1333.)

This consists in the use of metal moulds when casting articles from malleable iron.

CHRISTOPHERS, J. *Improvements in knives and forks whose handles are not metallic.* Dated June 4, 1856. (No. 1334.)

This relates only to knives and forks whose handles have a hole to receive the tang, and consists—1. In fitting the small end (bolster end) of the handle into a socket or groove in the handle end of the bolster around the tang, and then fastening the tang to the handle by a pin drilled across the hole through the handle and tang, at about the middle of the handle. 2. In fitting the small end of the handle into a metal band or cap, letting the bolster abut against the hole in the small end of the cap, and then fastening the tang to the handle by a pin as before. 3. In placing one-half of a very stout ferule round the small end of the handle, introducing part of the bolster into the other half of the ferule, and then fastening the tang to the handle by a pin as before.

BROOMAN, R. A. *Improvements in plating glass to render it reflective.* (A communication.) Dated June 4, 1856. (No. 1335.)

Glass is plated by depositing upon it substances decomposed by the action of acids, as in the galvanic battery, and in a gaseous or vapoury form, and by reducing and fixing such agents by electricity, or galvanism, or both, upon the glass. The invention comprises machinery for carrying it into effect.

SMITH, W. *Improvements in apparatus for regulating the supply of air to furnaces.* Dated June 4, 1856. (No. 1336.)

The patentee makes the motions of the valves or apparatus for admitting air to furnaces dependent upon the flow of quicksilver, water, or other fluid, through small channels or spaces within the regulators.

GIBON, A. L., and A. FRÖHLICH. *Certain improvements in economising fuel in the treatment of metals.* Dated June 4, 1856. (No. 1337.)

1. A peculiar arrangement of blast, refining, and puddling furnaces is used in order to prevent the metal from cooling before the succeeding operation takes place. 2. The otherwise waste heat of the furnaces constructed with the ordinary grates is employed to heat water contained in boilers placed upon such furnaces.

BETTS, J. *Improvements in the preparation or manufacture of artificial spheres.* Dated June 5, 1856. (No. 1338.)

The patentee describes certain expanding spheres which are opened and closed by means of ribs resembling the ribs of umbrellas.

NORRIS, J. jun. *An improvement or improvements in the manufacture of the cutting tools employed in nail-making machines.* (A communication.) Dated June 5, 1856. (No. 1339.)

In forming such cutting tools, the patentee employs a mixture of one-half of the best sterling iron incorporated with one-half of malleable iron; or equal parts of white and gray iron producing a malleable iron. The cutting tool being cast in either of these mixtures, and the ends and edges being chill cast, the cutter is dressed or faced on a lap.

BRAE, A. E. *Improvements in apparatus for communicating signals from one part of a railway train to another.* Dated June 5, 1856. (No. 1341.)

The patentee proposes certain alterations in an apparatus patented by him, June 24, 1853.

SINCLAIR, A. *An improvement or improvements in wrought iron pins for railway chair fastenings.* Dated June 5, 1856. (No. 1342.)

This invention was described and illustrated at page 370, vol. lxv., No. 1732.

HEWITSON, W. W., and W. H. BARTHOLOMEW. *Improvements in the construction of the furnaces or fire-boxes of tubular steam-boilers.* Dated June 5, 1856. (No. 1343.)

This invention cannot be described without illustrations.

HARLOW, R. *Improvements in the construction of water-closets, and in valves or taps for water-closets and other purposes.* Dated June 6, 1856. (No. 1348.)

In the improved self-acting water-closet, the seat when depressed opens a tap or valve to admit water into a tube, furnished above with a ball-valve which closes the air passages when the tube is full; when the pressure is removed from the seat the water in the tube cleanses the pan out. The improved ball valve is applied to the cisterns of other water-closets, &c. A tube of india-rubber is also placed around the spindle of valves or taps within the valve chamber, whereby the stuffing-box is dispensed with, and the valve raised off its seating when required; and, lastly, a ball clack of india-rubber is placed between the pipe to be supplied and the supply pipe.

SOMERVILLE, J. *Improvements in weaving.* Dated June 6, 1856. (No. 1349.)

The main feature of this invention is the working of the treddles of looms by the single and direct action of pattern mechanism, or mechanism capable of being set to any of the great variety of patterns which the apparatus is capable of working, instead of working the treddles by mechanism, the action of which is merely regulated by the pattern mechanism.

GARDISSAL, C. D. *Improvements in machinery for extracting fibrous and other products from vegetable substances.* (A communication.) Dated June 6, 1856. (No. 1350.)

In these machines green plants or other substances are submitted to friction and pressure, from which they can at any time escape when on the point of being injured. They are composed of plain or curved surfaces furnished with flutes or grooves.

CHAMBERS, T. *Improvements in agricultural drills.* Dated June 6, 1856. (No. 1352.)

A rotating hollow wheel or chamber is applied to each channel or furrow made by the drill. The wheel has spouts at intervals at its periphery. The seed and liquid manure are delivered into the wheel from the separate compartments of the drill, and flow out when, by the rotation of the wheel, spout or outlet comes to the ground.

STAMM, A. *Improvement in presses for packing, parts of which improvements are also applicable to other presses.* Dated June 7, 1856. (No. 1356.)

In presses in which knee-joints are employed, certain arrangements for working the knee-joints are used, and certain con-

trivances applicable to packing presses for opening the case which contains the compressed material, and for strengthening the case.

NEWTON, A. V. *An improved furnace for heating soldering irons.* (A communication.) Dated June 7, 1856. (No. 1357.)

This furnace (for tinmen's use) admits of coal being burned therein. It resembles a German stove, and is made of cast-iron, with a trough at bottom for holding water. The fire-place is fitted with radial cells for the soldering irons.

WILEY, W. E. *Improvements in the manufacture of metallic pens and pen-holders.* Dated June 7, 1856. (No. 1358.)

Each metal pen is formed with projecting portions, on which the points of the pen are supported above the surface on which it is laid. Each pen-holder has portions of the metal near the pens cut and bent outwards, so as to form projections.

RUCK, W. D., and V. TOUCHE. *Improvements in the manufacture of paper from fibres not hitherto applied to such purpose.* Dated June 7, 1856. (No. 1359.)

The fibres mentioned are those of the stem and leaves of sugar cane, Indian corn, bulrushes, and bass or bast. The patentees prefer to obtain the fibre by first crushing and then boiling them, first in water and then in alkali.

DYER, S. *Improvements in reefing, furling, and setting the sails of ships and vessels, also for protecting such sails from wet and other abuses caused by ropes and rigging.* Dated June 7, 1856. (No. 1360.)

The patentee employs a hollow yard, with an opening to allow the sail to pass in and out, such yard being provided with a roller (termed a rolling jackstay) extending from one end to the other of the interior of the yard, upon which roller the sail is wound (when reefed or furled) by suitable pulleys or wheels, &c.

ROBERTSON, A. *An improved inkstand.* Dated June 9, 1856. (No. 1361.)

In this inkstand, by screwing down a flange on the outer surface of a cup or funnel an elastic ring is compressed between two caps, and the air which it contains forced into the vessel containing the ink through a small tube, connected with an India-rubber ring, and inserted through a circular opening in the under cap. This causes the ink to flow into the small cup or funnel through the small pipe, which pipe reaches nearly to the bottom of the vessel containing the ink. By unscrewing the flange the pressure is removed from the elastic ring, when it expands and withdraws a portion of the air contained within the vessel, thereby allowing the ink to return through the said pipe.

SIEMENS, C. W. *Improvements in engines wherein superheated steam is used.* Dated June 9, 1856. (No. 1363.)

This invention consists of several improvements upon Mr. Siemens' regenerative steam engine,* which improvements will probably be described in an early number.

FERRIER, R. *Improvements in machinery or apparatus for sweeping and cleansing roads and streets.* Dated June 9, 1856. (No. 1365.)

This machinery is contrived for throwing up the swept-up mass to one or other side of the line of its path. It consists of a light frame, carrying a row of fixed scrapers or brushes, disposed so as to form a diagonal line, at an angle of 45°, more or less, with the line of the machine's path, the machine being guided by two wheels.

HOLDIN, J. *Certain improvements in machinery or apparatus for washing rags, which said improvements are also applicable for washing other materials.* Dated June 9, 1856. (No. 1366.)

A revolving rag-washing machine is furnished on its periphery (or at its sides) with shallow buckets, like an overshot water wheel, which buckets have their sole perforated, so that, as the machine revolves in a reservoir of water, the buckets take up the clean water, and as each bucket ascends to the uppermost part of the machine, the water rains through the rags, &c. The machine is supplied with agitators, to beat up the rags.

HOLDIN, J. *Certain improvements in machinery or apparatus for bowking, bleaching, dyeing, and washing textile fabrics or materials.* Dated June 9, 1856. (No. 1367.)

The patentee uses a revolving kier or wash wheel in a steam-tight chamber. The kier has round it shallow buckets with perforated soles, through which the liquids stream in upon the goods.

JOHNSON, J. H. *Improvements in the construction of rails for railways, and in the mode of securing the ends of rails for railways.* (A communication.) Dated June 9, 1856. (No. 1368.)

The improved rails are rolled with lugs or flanges on each side at intervals, and with half lugs at the ends spreading out into a broad base, thereby giving lateral stiffness, vertical support, and an efficient mode of attachment to the sleepers. The half-lugs at the ends, rest on and fit into dished plates of iron, recessed to receive them, having thin felt between the rail and plate. The rail is secured intermediately by pins or bolts passed through the base of the lugs into the sleepers. Modifications are also described.

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* See *Mech. Mag.*, vol. lxv., pp. 55 & 79, Nos. 1719-20.

Ellis, J. *Improvements in the manufacture of muriate of ammonia and carbonate of ammonia, and in converting certain ingredients employed therein into an artificial manure.* Dated June 9, 1856. (No. 1369.)

Carbonate and muriate of ammonia are manufactured from ammonia produced according to a former patent of the patentee's, dated 18th July, 1855, No. 1616, by certain stills, boxes, &c.

Skaife, T. *Spring-folding camera shutters for the more speedy and convenient mode of taking photographic pictures than has been hitherto adopted.* Dated June 10, 1856. (No. 1373.)

1. For the ordinary dark slide made use of in the camera for covering the sensatised plate, a pair of folding shutters is substituted, being so arranged as to be open and shut inside the camera by a small cord passing round two drums or levers, fixed on the axes of the shutters, which project outside the camera. 2. A second pair of shutters is to be opened and closed by a like arrangement, and fixed a little in front of the inner face of the lens, so that when shut, they will exclude the light, by covering the lens. Their object is to keep the lens covered until the first pair is opened.

Brooman, R. A. *Improvements in printing shawls and other fabrics, and in the machinery employed therein.* (A communication.) Dated June 10, 1856. (No. 1375.)

Claims—1. Shawls are printed by a single impression of a block of the same size as the shawl or fabric for each colour. 2. The fabries are printed by engraved cylinders supplied with colour from distributing rollers which receive it from cylinders working in a trough. 3. Colours are applied by a cylinder, or by two plates, one engraved or carrying a block with the pattern, and the other provided with felt or cloth interposed between the fabric and the second plate; one plate approaches the other, and the fabric is pressed between the two, and so printed. 4. Guides are employed to keep the block in position. 5. Colours are supplied either directly by cylinders, or by an intermediate piece of fabric. 6. In certain machinery which requires drawings to illustrate.

Pietroni, C. *Improvements in printing on cloth and other fabrics.* (A communication.) Dated June 10, 1856. (No. 1377.)

Machinery is employed to print fabrics by pressing them *up* against printing surfaces.

Parsons, P. M. *Certain improvements in the permanent way of railways.* Dated June 10, 1856. (No. 1378.)

A description of this invention will hereafter be given.

Preux, A. E. *Warming railway and other vehicles.* Dated June 10, 1856. (No. 1380.)

The patentee proposes to heat a vessel of water by means of lamps, the heated water circulating in foot warmers, &c.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Beadon, W. *Improvements in agricultural implements for cleaning, cultivating, and rolling land.* Dated June 2, 1856. (No. 1311.)

In the improved implements are several adjustable tynes, which act as a cultivator, and behind these a roller, from the axis of which motion is given to an axis carrying several bent teeth. Behind the roller, and before the rotating axis with bent teeth, are applied the tynes of an underground harrow having inclined projections on their upper surfaces, by which couch roots are raised to the surface, and then removed by a rake.

Cottam, G. H., and H. R. *Improvements in the manufacture of iron hurdles.* Dated June 2, 1856. (No. 1312.)

The horizontal rods or bars of iron hurdles are formed with collars, which (in putting the parts together) come against the uprights, and give stability to the hurdle.

Whitehead, W. G., and F. A. Harwood. *A new or improved candlestick.* Dated June 3, 1856. (No. 1319.)

In this candlestick the candle is raised and lowered by means of a screw. The body and foot are in separate pieces. The body turns upon the foot, and thus raises or lowers the candle.

Lebaillif, J. J. *Improvements in beating, cleaning, napping, and dressing cotton, wool, flax, tow, and other similar fibrous substances, and stuffs or woollen cloths.* Dated June 3, 1856. (No. 1320.)

The fibres of a plant growing in the Brazils, called piassava or piazava, are used for the above purposes. They are formed into bundles and placed round a cylinder, projecting two or three inches.

Verdeil, F. A. *Improvements in obtaining a particular green colouring matter from artichokes and thistles.* Dated June 3, 1856. (No. 1323.)

The plants are to be cut small or bruised, soaked in water, and boiled; the liquid being pressed out, is then filtered, and alkali added, the liquid being constantly stirred. The colouring matter may be obtained by evaporating to dryness, or it may be precipitated by spirit, or by acids, or may be allowed to ferment before evaporation.

Bullough, A. *Improvements in the mode or method of leasing warps.* Dated June 4, 1856. (No. 1327.)

One portion of the warp threads is passed

through some glutinous composition which will keep them together, and then, by drawing the other portion tight, leaving the slack portion in the composition, the lease will be formed at once, presenting a shed, through which a cord, lath, &c., may be inserted.

MARLE, C. L. *Improvements in preserving animal and vegetable substances suitable for food.* Dated June 4, 1856. (No. 1332.)

The substances are cut up, the pieces hung up in heated carbonic acid gas, removed, dipped for a short time into a bath of gelatine, dried, and plunged into a bath containing tanning. When removed and dried, they are ready for packing, and should first be covered with coarsely powdered bark.

BRETON, J. LE. *A photo-gas or apparatus, with air-draughts of hot oxygen, when applied to oil lamps, with wicks for lighting and heating.* (A communication.) Dated June 5, 1856. (No. 1340.)

This invention cannot be described without illustrations.

DALLAS, D. C. *Improvements in chemical preparations applicable to the photographic and photogalvanographic processes.* Dated June 5, 1856. (No. 1344.)

Chromic acid is employed by the inventor, either alone or in combination with photographic or other materials.

LANG, D. *Improvements in obtaining and applying motive power.* Dated June 6, 1856. (No. 1345.)

Common atmosphere is to be accumulated in vessels so as to produce a constant pressure, and cause it to act similar to steam in propelling machinery!

ROBINSON, J. *Improvements in railway chairs, or in means for securing rails thereto.* Dated June 6, 1856. (No. 1346.)

For securing rails to chairs an axis is used, having an eccentric formed on it. The axis rests in bearings in a loose block, or in the chair, so that when turned, its eccentric acts upon a loose block placed against the side of the rail, or against the chair, or a loose block placed against the jaw of the chair, and forces the loose block tightly against the rail. The axis is prevented from turning back by a pawl.

BEYER, C. *Improvements in locomotive engines.* Dated June 6, 1856. (No. 1347.)

In "outside cylinder engines," the eccentrics are placed between the driving wheels and the bearings of their axles, which bring the valve gear wholly on the outside of the framing of the engine, and allows a simplification of the cylinders in their valve boxes and steam passages.

JUKES, J. *Improvements in the furnaces of locomotive boilers.* Dated June 6, 1856. (No. 1351.)

The fire-box and fire-bars of a locomotive are so arranged that an endless chain of fire-bars may be moved through the fire-box. The water spaces at the front and back of the fire-boxes do not descend so low as the sides between the two sides. Above the parts of the fire-bars, where they enter the fire-box, is formed an arch of brick, to assist in igniting the fuel as it enters into the fire-box.

FONTAINEMOREAU, P. A. L. DE. *Certain improvements in heating water for steam boilers.* (A communication.) Dated June 6, 1856. (No. 1353.)

This consists in a mode of heating water for boilers by injecting waste steam into a feed vessel.

NEWTON, A. V. *Certain improvements in rotary engines.* (A communication.) Dated June 6, 1856. (No. 1354.)

This invention relates to a certain arrangement of chambers around the interior of a hollow cylinder by securing to the cylinder sheets of vulcanized india-rubber, and a number of piston rollers, attached to a shaft placed concentrically to the cylinder, the rollers being arranged so as to press against the india-rubber, and force it in contact with the cylinder, thereby closing the several chambers.

ELLISON, P. *Improvements in furnaces, and the mode of working the same, for the manufacture of black ash or crude soda.* Dated June 6, 1856. (No. 1355.)

1. The furnaces are constructed so that each charge of the materials may be worked on the same bed or bottom from the beginning to the end of the operation. 2. The furnace with its fire-places and ash-holes is arranged in such a manner that each charge of materials successively shall have the benefit of the full heat of the fires before the charge is withdrawn.

HOWELL, J. B. *Improvements in the manufacture of cast-steel tyres for railway locomotive engine and carriage wheels.* Dated June 9, 1856. (No. 1362.)

Tyres are formed of cast-steel, by casting them in a mould on the outer rim of a disc, which is caused to rotate at a considerable velocity. The centrifugal action causes the fluid metal to condense and fill the mould. Rotation is continued until the metal has set.

FIELD, W. and E. JEFFREYS. *Improvements in machinery for sowing seed and for distributing manure.* Dated June 9, 1856. (No. 1364.)

To prevent the choking of the spouts of seed and manure drills and to ensure an equable discharge from the hoppers, the inventors provide a fan or fans, driven rapidly by suitable mechanism as the drill is moved across the field, and thus a blast of air

which forces forward the seed or manure is created.

SMITH, B., and W. KALTHOFF. *Improvements in economising fuel in the locomotive and other steam engines.* Dated June 9, 1856. (No. 1370.)

To the fire-box of locomotive engines certain blowing apparatus is adapted for supporting combustion, coals being employed instead of coke.

PROVISIONAL PROTECTIONS.

Dated November 3, 1856.

2580. Eugène Napoléon Cadet, of Rue Folie Méricourt, Paris, manufacturer. Improvements in the construction of cocks and taps.

Dated December 23, 1856.

3046. Alexander Ross, blacksmith; James Valentine, factor; Alexander Murray, teacher; and Alexander Don, general merchant: all of Fettercairn, Kincardineshire. Certain improvements in the purification of coal-gas, the residuum of such purifying process being applicable either as a manure or for manufacturing gas from.

Dated January 20, 1857.

162. William Edward Newton, of Chancery-lane, civil engineer. Certain improvements in sewing-machines. A communication.

164. Frederick Crace Calvert, of Manchester, professor of chemistry. The use or application of certain substances in stiffening, sizeing, or otherwise preparing textile fabrics and paper.

166. Victor Augustin Kientzy, of Paris, civil engineer. Improvements in machinery to be worked by steam or other power, for clearing and ploughing land.

168. Richard Quin, of Poland-street, jewellery and photographic case manufacturer. Improvements in stereoscopes.

170. Thomas Boyle, of Pilgrim-street, Ludgate-hill, City. Improvements in outside reflecting lanterns.

172. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in apparatus for the preservation of money, books, papers, and other property, in case of disaster to ships and other vessels. A communication from J. T. Garlick, of New York.

Dated January 21, 1857.

173. Luke Duncan Jackson, of Underwood, Nottingham, engineer. An improved beer-engine or syphon and vent-peg, to be used for the purpose of drawing or pumping ales, beer, or other fluids.

174. John Massey, of Burnley, Lancaster, cotton-spinner, and James Hargreaves, jun., of the same place, manager. Certain improvements in machinery or apparatus employed in the preparation of cotton and other fibrous materials for spinning.

175. Henry Chamberlin, jun., of Narborough, Norfolk, gentleman. Improvements in implements or apparatus for ploughing, tilling, or cultivating land.

176. Eloi Jean Baptiste Ledure, of Paris, civil engineer. An improved railway-break.

177. William Charles Scott, of Waltham-cottages, Camberwell, gentleman. Improvements in apparatus for separating coin.

178. Robert Ker Aitchison, of London, gentleman. Improved apparatus for the amalgamation of precious metals.

179. Samuel Dyer, of Bristol, ship-owner. Certain improvements in ships' fittings such as mast-hoops, jib-hanks and jib and other travellers.

181. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. Improvements in the manufacture of lubricating compositions. A communication.

182. Samuel Neville, of Gateshead, glass-manufacturer. Improvements in machinery or apparatus employed in the annealing of glass and the firing of pottery ware.

183. Thomas Harris, of Regent's-park, consulting brewer. Improvements in apparatuses for refrigerating or cooling, and regulating the temperature in worts and beer, which may also be employed as condensers in distilling.

184. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improved means of transmitting messages by audible signals. A communication.

185. Henry Cater, of Anchor-terrace, Southwark, boiler-maker. Improvements in steam-boilers.

Dated January 22, 1857.

187. Leonard Bower, of Birmingham, manufacturer. An improvement or improvements in the manufacture of bolts, rivets, spikes, screw-blanks, nuts for screws, and washers.

188. François Alexandre Nicolas Delsarte and Elisée Valin, both of Paris, gentlemen. Improvements in pianos and other stringed musical instruments.

189. James Warne, of Weymouth-place, New Kent-road, pewterer. A new combination of metals applicable to decorative and useful purposes, part of which invention is applicable also to the method of combining metals and alloys of metals.

191. Elisha Mander, photographic case manufacturer, of Birmingham, and William Morgan, manufacturer, of the same place. Improvements in the manufacture of photographic, jewellers' and other cases, having wood or papier-maché foundations, and where raised, regular, or irregular forms are required in such cases, and the machinery for carrying out such improvements, parts of which are applicable to other purposes where sawing or shaping is required.

192. Carl Christian Engström, of Stockholm. Improvements in the construction of projectiles for rifled guns and mortars.

193. John Rubery, of Birmingham. Improvements in runners, top-notches, and other parts of umbrellas and parasols.

194. Gustave Perez di Termini, of Friday-street, City. Improvements in the construction of artificial hands.

195. George Haden Hickman and Alfred Hickman, of Bilston, Stafford, ironmasters. An improvement in the method of manufacturing strip and hoop iron, used for making wrought iron tubes and other purposes.

196. Ernst Luedeke, of Nottingham. Improvements in obtaining power when steam, gas, or air is used.

197. Robert Johnstone, of Cambridge-place, Agar Town, St. Pancras. Improvements in the manufacture of fire-wood for lighting fires.

198. William Roberts, of Millwall, engineer. Improvements in arranging ships' and other similar pumps.

199. Henry William Wimshurst, of St. John's Wood, gentleman. An improved mode of manufacturing sheet metal.

200. James Garth Marshall, of Leeds, flax-spinner. Improvements in preparing flax, hemp, china grass, and other vegetable fibrous substances.

201. Frederick Sadgrove, of Union court, Old Broad-street, City, surveyor. Improvements in the construction of window or other sashes or shutters and frames.

Dated January 23, 1857.

202. Abraham Hemingway and Thomas Wheat-

ley, both of Openshaw, near Manchester, engineers. Improvements in slide-valves for steam engines and other purposes.

203. George Bedson, of Manchester, manager. Improvements in coating iron and other metal with metals or metallic compounds.

204. Charles Fréderic Vasserot, of Essex-street, Strand, mechanical draughtsman. An improved gasogene. A communication.

205. Charles Fréderic Vasserot, of Essex-street, Strand, mechanical draughtsman. A hydrostatic bellows. A communication from E. A. L. d'Argy, of Batignolles, France.

206. Charles Fréderic Vasserot, of Essex-street, Strand, mechanical draughtsman. An improved phosphoric fusee or tinder-box and lighter. A communication from E. A. L. d'Argy, of Batignolles, France.

207. George Eskholme, of Rotherham. York, engineer, and Henry Wilkes, of the same place, brassfounder. Improvements in ball or other cocks.

208. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris. Certain improvements in fire-arms, and in the bullets to be used therewith. A communication.

209. John Folliott Powell, of Albion-place, Hyde-park. Improvements in reverberatory and other furnaces.

210. George Fergusson Wilson, of Belmont, Vauxhall. An improvement in the manufacture of night-lights.

211. Pier Alberto Balestrina, of Brescia, Italy. Improvements in electric telegraphs.

212. George Fergusson Wilson, of Belmont, Vauxhall. Improvements in the manufacture of candles.

Dated January 24, 1857.

213. Thomas Ayles and Robert Andrews Ayles, jun., of Weymouth, Dorset, ship-builders. Improvements in the construction of ships and other vessels navigating on water.

215. John Whines, of Pimlico, carpenter. Improvements in machines for dovetailing, grooving, slotting, and rabbeting.

217. Joseph Walton, of Bradford, York, machine-maker. Improvements in looms for weaving.

219. Daniel Green, of Vauxhall, potter and drain-pipe manufacturer. Improvements in potters' kilns.

221. Henry Bessemer, of Queen-street-place, New Cannon-street, City. Improvements in the manufacture of iron and steel.

Dated January 26, 1857.

223. François Constance, of Paris. An improved apparatus for casting and finishing types and vignettes used for printing.

225. John Haile, of Warren, Rhode Island, U. S. A., at present residing at Birmingham, engineer. Improvements in machinery for the manufacture of nails.

227. William Littell Tizard, of Plymstock, Devon, brewers' engineer. Improvements in fermenting, cleansing, and attemperating apparatus to be employed in brewing.

229. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. A method of lubricating and preventing the heating of axles, journals, and bearings in railway engines and carriages. A communication from S. Laurent.

231. Francis Hamilton, of Acton, Middlesex, gentleman; Charles Burrell, of Thetford, Norfolk, engineer; and James Boydell, of Gloucester-crescent, Camden Town, engineer. Improvements in combining ploughs with locomotive engines.

233. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in sewing machines. A communication from J. E. A. Gibbs, of Virginia, U. S.

Dated January 27, 1857.

235. James Stead Crosland, of Openshaw, near Manchester, engineer. Improvements in locomotive and other steam engines.

237. John Dangerfield, of West Bromwich, Stafford, engineer. Improvements in the manufacture of chains.

239. George Léonard Doelling, of Rue Drouot, Paris. Improvements in machinery or apparatus for forming screw-threads.

Dated January 28, 1857.

243. John Elce, of Manchester, machinist, and John Hewitt, of the same place, foreman. Certain improvements in mules and other machines for spinning and doubling.

245. Charles Whowell, of Two Brooks, Tottington, Lancaster, bleacher. Improvements in machinery for stretching, drying, and finishing woven fabrics.

247. George Cranstoun Trotter Cranstoun, of Chirnside Bridge, Berwick, N. B., paper-maker; George Young, of Dunse, in the same county, plumber; and John Lovell, of Chirnside Bridge, in the same county, paper-maker. Improvements in generating steam.

249. Walter Henderson Sisterson, of Southwark, engineer. An improvement in cranes.

251. Andrew Peddie How, of Mark-lane, City, engineer. An improved anti-garotte cravat.

253. James Lee Norton, of Bromley, Middlesex. Improvements in steeping or washing and rinsing machines.

255. James Lee Norton, of Bromley, Middlesex. Improvements in separating animal from vegetable fibres.

257. George Fergusson Wilson, of Belmont, Vauxhall. Improvements in treating Burmese and such like petroleum.

259. Henry Chamberlin, jun., of Narborough, Norfolk, gentleman. Improvements in paving or covering the surfaces of roads, streets, or ways.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," February 10th, 1857.)

2295. J. Begg. Improvements in preparing and bleaching textile fabrics and materials.

2299. R. G. Salter. A method of, and apparatus for, expediting the stamping or marking of letters, papers, labels, and documents, and improvements in, and additions to, stamping and marking instruments or apparatus, or in connection therewith.

2302. D. Jones. Certain improvements in obtaining and applying motive power.

2305. E. Hardon and J. Henry. Improvements in looms for weaving, and in machinery for communicating motion to looms and other machines.

2307. J. Renshaw. Certain improvements in machinery or apparatus for cutting or producing the pile of plain or figured velvets, or other pile-cut goods or fabrics.

2308. V. Renault. Improvements in regulating and directing the steam escaping from the cylinders of locomotive engines.

2309. D. Desmond. Improvements in vessels and apparatus for storing, improving, and discharging liquids.

2310. H. J. Distin. Improvements in the means of regulating the tone of kettle-drums. A communication.

2311. R. Edmeston. Improvements in looms for weaving.

2312. C. Goodyear. Improvements in securing the openings of air-tight and other bags and packages.

2316. J. Hall, jun. Improvements in looms.
2320. D. O. Boyd. Improvements in constructing and arranging smoke and air-flues.
2323. J. Allen. Improvements in coats.
2327. A. Picard. An improved tobacco-pipe.
2334. H. Mackworth. Improvements in the separation and treatment of mineral substances, and in coking, and in apparatus connected therewith.
2354. W. Bradford. Improvements in the arrangement of gas-burners for lighting and ventilating.
2372. J. S. Hendy. Improvements in fire-stoves or grates used for domestic purposes.
2397. G. B. Piatti. Improvements in the production of ice.
2403. R. A. Brooman. An improved method of, and composition for splitting or rending rock, stone, and earth. A communication.
2407. J. H. G. Wells. Improvements in windlasses. A communication.
2410. B. J. Heywood. Improvements in valves for inflating air-tight bags, cushions, and other similar articles, and for drawing off liquids.
2413. G. Hazeldine. Improvements in carriages requiring poles between the horses or draught animals.
2444. I. Delcambre. Improvements in machines for composing and distributing type.
2474. G. Thomson. Improvements in machinery for cutting or rending wood for laths and other uses.
2481. F. Walton. Certain improvements in the manufacture of brushes.
2494. L. A. Desachy. Improvements in producing architectural mouldings, ornaments, and other works of art, formed with surfaces of plaster or cement.
2498. G. White. An improvement in the treatment of grain, in order to produce starch and spirit therefrom.
2515. B. Ferrey. An improvement in producing ornamental plastering or stucco work.
2519. T. Allan. Improvements in the permanent way of railways.
2525. E. T. Simpson. Improvements in the manufacture of soap.
2547. J. T. Way. Improvements in obtaining light by electricity.
2552. H. Holcroft. An improved steam engine, specially applicable to agricultural operations.
2560. F. C. Matthews. Improvements in preparing manure.
2605. W. Seed and W. Ryder. Improvements in certain parts of machinery for slubbing and roving cotton and other fibrous materials.
2668. R. A. Brooman. Improvements in the preparation of fibres for spinning, and in machinery employed therein. A communication.
2916. T. Peake. Certain improvements in the manufacture of chenille and other piled fabrics.
3105. W. McCulloch and T. Kennedy. Improvements in stop-cocks or valves.
112. J. Barsham. An improvement in the manufacture of mats or fabrics used for packing.
124. C. W. Williams. Improvements in furnace-grates and fire-bars.
153. T. Sagar and C. Turner. Certain improvements in power looms for weaving.
164. F. C. Calvert. The use or application of certain substances in stiffening, sizeing, or otherwise preparing textile fabrics and paper.
175. H. Chamberlin, jun. Improvements in implements or apparatus for ploughing, tilling, or cultivating land.
189. J. Warne. A new combination of metals applicable to decorative and useful purposes, part of which invention is applicable to the method of combining metals and alloys of metals.
192. C. C. Engström. Improvements in the construction of projectiles for rifled guns and mortars.
207. G. Eskholme and H. Wilkes. Improvements in ball or other cocks.
210. G. F. Wilson. An improvement in the manufacture of night-lights.
211. P. A. Balestrini. Improvements in electric telegraphs.
212. G. F. Wilson. Improvements in the manufacture of candles.
247. G. C. T. Cranstoun, G. Young, and J. Lovell. Improvements in generating steam.
257. G. F. Wilson. Improvements in treating Burmese and such like petroleum.
259. H. Chamberlin, jun. Improvements in paving or covering the surfaces of roads, streets, or ways.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1854.

277. George Mills.
287. Auguste Louis Nicolas Comte Vander Meere.
297. Henry Olding.
300. Alphonse François Damiens Duvillier.
302. James Taylor, Isaac Brown, and John Brown.
320. David Brown and John Brown.
326. James Young.
332. William Whiteley.
347. James Cox.
369. George Fergusson Wilson.
377. George Fergusson Wilson.

LIST OF SEALED PATENTS.

Sealed February 6, 1857.

1863. Samuel King.
1869. Thomas Austen.
1878. John Darlington.
1883. George Anderson.
1917. John Weir Draper Brown and George Gibson Brown.
1929. Richard Archibald Brooman.
1955. Thomas York.
1962. William Edward Newton.
2005. Richard Archibald Brooman.
2006. Bernard Augustus Grautoff and Charles Henry William Albrecht.
2007. Thomas Watson.
2045. Simon Ghidiglia and Louis Turletti.
2206. John Underwood and Frederic Valentine Burt.
2411. Archibald Turner and Luke Turner.
2467. George Blair.
2821. Archibald Turner.
2951. Rafaello Louis Giandonati.
2957. Henry Pease and Thomas Richardson.
2981. John Stobo.
3027. Daniel West.

Sealed February 10, 1857.

1888. Nicholas Doran Maillard.

1894. David Lesser.
1895. Richard Dugdale Kay.
1901. John Knowles and William Clarke.
1924. William Tytherleigh.
1934. Pierre Noyer.
1953. William Akroyd and John Thompson.
2016. James Blake and Francis Maxwell.
2038. Pierre Joseph Guyet.
2094. Thomas Restell.
2345. William Wilkinson.
2358. David Joy and William Holt.
2585. Henry Bessemer.
2726. Henry Bessemer.
2818. Robert Griffiths.
2828. Laban Clarke Stuart.
2877. Laban Clarke Stuart.
2908. James Blain.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

Errata.—In our reply to "*A Constant Reader*," in our last, two awkward errors were accidentally allowed to stand uncorrected. The word "weight," in the fifth line, should have been "height," and the words "and the increment of volume," in the ninth line, should have been "*a* the increment of volume."

We have, and have had for some time, letters from Mr. Pitter, Mr. Herbert, Mr. Stevenson, and others, standing over, and as Mr. Baddeley's valuable Annual Report on London Fires is nearly ready for publication, we fear we shall have to tax the patience of our correspondents yet somewhat longer. We shall do so with reluctance.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine*, must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1750.] SATURDAY, FEBRUARY 21, 1857. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

KENNEDY'S WATER METER.

Fig. 1.

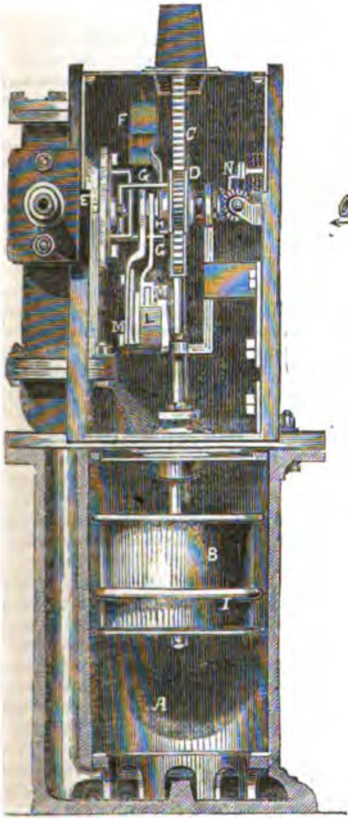
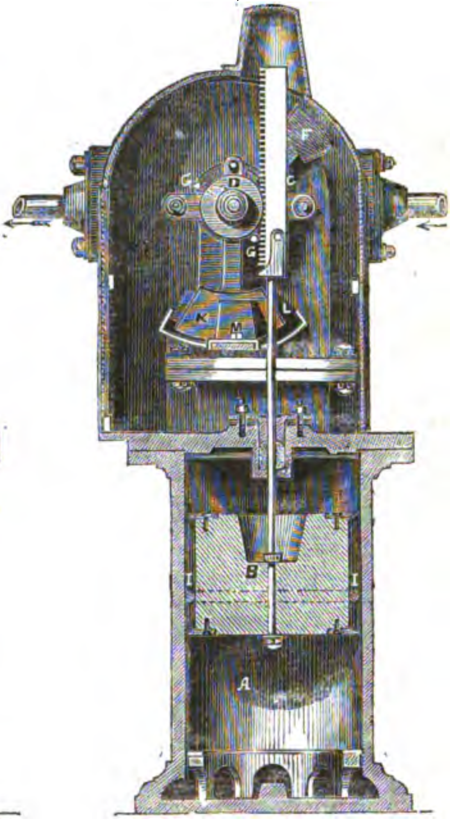


Fig. 2.



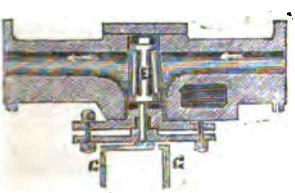


Fig. 4.

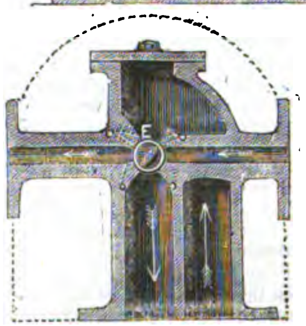


Fig. 3.

KENNEDY'S WATER METER.

EXPERIENCE has shown that the water meter of Mr. Kennedy, of Kilmarnock, possesses many merits, and has gained the patronage of the first engineers of the kingdom. A description of it will, therefore, be acceptable to our readers.

It is constructed on the principle of measurement by capacity, and is made with a cylinder and piston; it has been found to measure correctly and uniformly under every variation of pressure or velocity of flow. The water is discharged in a steady and continuous stream, without any shock, concussion, or intermission; the piston moves with great ease, and is likely to be durable and easily kept in order.

The meter is shown in figs. 1 and 2 of the engravings on the preceding page. Fig. 1 is a side elevation, with the casing removed to show the internal mechanism, the measuring cylinder being in section. Fig 2 is a vertical section. The cylinder, A, is fitted with a water-tight piston, B, the rod of which carries a rack, C, gearing into a pinion, D, connected with the counting apparatus. The water is admitted alternately above and below the piston by means of a fourway cock, E, which is reversed when the piston arrives at either end of the cylinder. The reversing is effected by a tumbler, F, falling over alternately upon two arms, G G, on the spindle of the fourway cock, E, the tumbler being raised during each stroke of the piston by a stud or catch, H, fixed on the pinion, D. The piston, B, is rendered water tight by a "rolling packing," consisting of a ring, I, of vulcanised India rubber of circular section, which is drawn on the body of the piston like an India-rubber band; in consequence of its elasticity the ring accommodates itself so completely to the space between the body of the piston and the cylinder as to make a water-tight packing in a simple and effectual manner. The rolling action of the packing ring diminishes the friction, and consequently the liability to wear and tear, and the packing being impervious to water, is not liable to rot or decay; this is one of the peculiarities of the meter, which is presumed to have overcome a material difficulty. It has been found from experience that no other packing would endure for a reasonable length of time; any other material which might be fitted water tight causes too much friction, and is liable to become leaky after wear; even the India rubber would be open to the same objection, were it not for its rolling action. It may be observed that the rolling packing, although admirably suited to the present purpose, would not be serviceable on a piston or plunger which had to meet much resistance, being efficient as a water-tight packing only when exposed to nearly equal pressures on both sides, as in the present case, the piston merely floating in a current, and raising only the weight of the tumbler, F, by which the cock, E, is worked.

The cock or valve, E, shown in figs. 3 and 4, fig. 3 being a vertical section through inlet or outlet pipes, and fig. 4 a sectional plan. It is so constructed as to reverse the water to opposite ports without the aid of an air vessel, causing not the slightest increase of friction, or any stoppage or check to the uniform flow of the water. The valve barrel is formed on the plan of a fourway cock, the key or plug being made more on the principle of a steam throttle valve; it does not completely cover the ports in crossing to reverse, but as the central position of the valve across the port is but momentary, the escape of water through the valve, which saves the recoil, is so inappreciable in quantity as not to cause a variation of one per cent. under the most extreme trial.

The tumbler or weighted lever, F, which reverses the valve, is worked from the piston, B, the rod of which carries the toothed rack, C, in gear with the pinion, D; the shaft of the pinion is in the same line with the valve plug or key, on which is fixed a pair of bent lever arms, G G, 4, placed for the tumbler, F, to fall against on either side. During the stroke of the piston, the tumbler is raised up to a vertical position by means of a lifter or stud, H, attached to the pinion, D; but being loose on the shaft of the pinion, immediately on passing the centre it falls over by its own weight, striking the upraised arm of the valve, E, which is instantly reversed. The water which has passed into the cylinder is then discharged by the return stroke of the piston, and the action continues in the same manner as in an ordinary high pressure steam engine. The tumbler is prevented from turning the valve too far over by a buffer, K, suspended loose from the spindle of the pinion, D; the buffer receives the surplus force of the fall of the tumbler, and is limited to a small motion by the checks, L; its resistance is increased by the friction of the guides, M, between which it vibrates.

The indicating apparatus, N, is contrived to suit a variable flow of the water and its non-elastic condition, as it was found that the piston would not work to a definite length of stroke when the volume of flow varied. When the discharge was great the stroke was a little longer than with a small discharge; and to have made the piston work between checks, and count the strokes for indication, as has been done in other cylinder and piston meters, would not answer, because the actual distance travelled by the piston has to be

measured, and the piston must have a free and independent action, and be allowed to float in accordance with the current; otherwise severe reaction, concussion, and derangement would be produced. Therefore to obtain accurate registration, the indicating apparatus, N, is attached to the shaft of the pinion, D, and made to move uniformly forward in one direction by means of a pair of ratchet wheels, while the piston traverses either upwards or downwards, giving always accurately the distance travelled by the piston; then the area of the cylinder being known, the indication of the quantity of water passed through must be correct, whether long or short strokes be made by the piston.

The amount of head pressure required to move and work this meter is very small, and would rarely be felt of any importance.

"The meters for actual use are made," says Mr. Kennedy, "so strong in all their parts as to stand the heaviest pressure in use in this country; they will work in any situation with complete freedom and accuracy, irrespective of the size, length, or distance of inlet or outlet pipes; and the meter may be placed on any part of the line of service pipe leading to the premises to be supplied. After passing though the meter, the outlet pipe may be branched in any direction, and the water drawn off in any quantity by as many outlets or cocks as may suit the convenience of the consumer; so that by the use of this meter the amount consumed is correctly registered, and no cistern is required where a constant supply can be obtained."

LONDON FIRES IN 1856.

Twenty-sixth Annual Report. By Mr. William Baddeley, C.E., Inventor of the Portable Canvas Cisterns, Improved Jet-spreaders, Farmer's Fire-engine, &c., &c.

"The statistics of London Fires are by no means devoid of interest, and the time may come when they will form an index to the social advancement of the people; for, in proportion as houses are built more and more fire-proof, and habits of carefulness become more and more diffused, the number of destructive fires will assuredly lessen."—*Knight's London.*

A writer in the *Daily News* recently observed that "at this age of the world all fires should be considered unpardonable—all extensive conflagrations a social crime—unless they arise from uncontrollable circumstances;" and that "serious fires are a strong feature of barbarism existing in the midst of the most complete application of science to the arts of life that the world can show." If this be a just view of the matter, the records of the past year afford but little ground for congratulation, seeing that in the metropolis and its suburbs, no less than 957 fires (393 of them serious ones) are known to have occurred during that period.

The total number of London fires in 1856 (957) was 25 less than occurred in the preceding year, but an increase of 216 upon the average of the previous 23 years. The number of *totally destroyed*, 34, is very nearly the average proportion for that period.

The number of *seriously damaged* again shows an increase, the present number 359 being an increase of 25 as compared with the previous year, and an increase of 52 upon the return for 1854. The number of slightly damaged was 564.

Of these fires 250 were extinguished by the inmates of the premises without assistance; 340 were extinguished by the inmates with casual aid; while the extinction of 367 devolved upon the firemen. Parish engine-keepers have rendered essential service at upwards of 70 fires.

The singular manner in which fires prevail for a time in particular localities has often been remarked. During the past year, the neighbourhoods of Shoreditch and Bethnal-green have been the subject of such a visitation; within a circle of about half a mile radius, Shoreditch Church being the centre, upwards of 80 fires—one-twelfth of the whole number reported—have taken place.

The following table shows the monthly distribution, and particulars of last year's fires:

Months.	Number of Fires.	Fatal Fires.	Number of Lives Lost.	Chimneys on Fire.	False Alarms.
January	76	1	1	2	6
February	74	1	2	9	4
March.........	88	0	0	7	5
April	82	2	4	6	6
May	65	1	2	6	10
June	67	1	3	7	4
July	75	5	6	5	12
August	97	0	0	4	9
September...	84	0	0	5	6
October	74	0	0	6	4
November...	90	0	0	4	2
December ...	85	2	3	11	7
Total......	957	13	21	72	75

Instances in which insurances were known to have been effected:

Upon the building and contents	283
Upon the building only	94
Upon the contents	247
Uninsured	333
	957
Chimneys on fire	72
False alarms	75
Making the total number of calls ...	1104

To the *Royal Society for the Protection of Life from Fire*, the past year has proved a period of extended usefulness, of great success in saving life, and of public confidence and appreciation of the Society's usefulness correspondingly increased. During the year, three new fire-escape stations have been established in neighbourhoods at once both poor and populous, and long needing the protection now happily supplied. The first of these is at the "Sturt's Arms Tavern," New North-road, Hoxton; the second at the Shoreditch Workhouse, in the Kingsland-road; and the third at St. George's-in-the-East. Great credit is due to the parochial authorities of St. Leonard, Shoreditch, and St. George's, for the earnest and effectual manner in which they have co-operated with the *Royal Society* in establishing these stations. The present number of fire-escape stations is 46, arranged as nearly as possible at half-mile distances, attended throughout the night by brave and skilful conductors, prepared to render all possible assistance wherever their services are demanded.

The vestry of St. Mary, Islington, have recently determined upon adding three new fire-escape stations to the two already existing in that parish, and to maintain all five out of the rates; thereby distributing the expense (less than one penny per annum for each inhabitant) fairly among the parishioners. Another station in Southwark has also been determined upon, so that early in the present year, the Society expect to have fifty fire-escape stations in full operation.

During the past year, 367 fires have been attended, and the total number of persons rescued from burning buildings by the escapes and conductors of the *Royal Society* in that period, has been seventy-six, as shown by the subjoined statement:

Date.		Place.	Conductor's Name.	Lives Saved.
January	1	No. 53, Princes-street, Leicester-square ...	Christianson.	7
February	6	259, Whitechapel-road	S. Wood.	4
March	23	53, Goswell-road	Wakem.	2
April	19	125, High-street, Shoreditch	Barton.	5
,,	28	91, Leadenhall-street	McComb.	7
,,	29	106, Back-church-lane, Whitechapel ...	S. Wood.	2
May	5	4, Church-row, Aldgate	McComb.	2
July	2	32, Upper Eaton-street, Pimlico	Lewis.	5
,,	13	54, Fetter-lane, Holborn*	Arkell.	3
August	3	7, Ave-Maria-lane, Ludgate-hill ...	Wheatley.	8
,,	4	246, Whitechapel-road	S. Wood.	3
,,	17	3, Church-street, Shoreditch	Barton.	3
,,	31	54, Back-church-lane, Whitechapel ...	S. Wood.	6
November	9	167, Upper-street, Islington	W. Wood.	1
December	1	7, King's-place, Commercial-road East..	S. Wood.	4
,,	13	143, Upper Whitecross-street	Gassion.	9
,,	23	46, Old-street, St. Luke's	Gassion.	5
				76

The direct usefulness of this society during the thirteen years since its re-establishment, may thus be briefly summed up:—6 fire-escape stations increased to 46; 3,040 fires attended; and 367 human beings rescued from death.

But great and almost inestimable as are these direct results, the value of an institution like this cannot be said to rest here—there is the silent influence it exercises by its rewards, and by making public, noble, and intrepid exertions in saving life from fire, whether by means of its own men or others, and whether occurring in the metropolis, or in any part of the country.

Neither can the usefulness of the fire-escape stations themselves be estimated by the number of persons they are instrumental

* The husband of the present occupier of these premises was killed by jumping from an upper window, when a fire broke out in the shop, December 6th, 1847 (*vide Mech. Mag.*, vol. xlix., page 106.) The present case was one of great merit; after the Conductor had brought three of the inmates down his escape, and provided for the safety of the other two, he went through the smoke down stairs into the shop (an oil-shop), where he found that a bottle of blue-light powder had ignited spontaneously, and set fire to the shelf and staircase. Immediately over the shelf was a vat of turpentine, and, in close proximity, a quantity of gunpowder. Having procured water from the first-floor, Arkell extinguished the fire, and thereby averted the threatened catastrophe.

in rescuing from houses on fire: there is the feeling of comfort and security afforded to every one, by the mere knowledge of such aid being at hand during all hours of the night. The anxious mother and the timid child are alike reassured by its proximity to their home; and scarcely less so the prudent householder himself, whose careful provision against the loss of his property renders him perhaps even more sensitive to the personal danger to which all dear to him are exposed; the possible necessity for the attendance and successful exertions of the fire-escape conductor at his dwelling, must often present itself to his mind—it may prove beyond all value to him, even amidst the ruin of house and property.

> " For whatsoe'er the flames have reft,
> A sweeter comfort still is left,
> He counts the heads of loved ones round,
> And, joy! not one is wanting found."

The number of *fatal fires* and of lives lost, presents a gratifying decrease as compared with former years; these cases may be classified under the following heads:

	Fires.	Lives Lost.
Personal accidents from ignition of wearing apparel, &c.	4	5
" " " bedding	1	1
" " " explosion of fire-works	1	1
Children locked in rooms, and playing with fire, &c.	4	8
Inability to escape from burning buildings*	3	6
Total	13	21

Of the *fatal fires* the following require a passing notice:—Shortly after one o'clock on Sunday morning, June 22nd, a fire broke out in the lower part of a small house, No. 2, Leman-street, Whitechapel, occupied by Mrs. Solomons, clothier and outfitter. The shop and two rooms over, with a kitchen in the basement, comprised the whole of the premises. The fire was discovered by a female in the street, who knocked loudly at the door, and raised a cry of "fire!" Elizabeth Solomons (aged nine years) got out of bed, and perceiving the shop was in flames, and escape in that direction impossible, she jumped from the window, and was caught unhurt. Mrs. Solomons, who was next aroused, immediately threw herself from the window, leaving behind a son and two daughters, of the respective ages of two, seven, and ten years. A ladder was brought from the "Red Lion Tavern," opposite, but the dense body of smoke and flames which issued through the fan-light enveloped and concealed the entire front of the premises. Conductor Wood (one of the Society's most intrepid conductors) was promptly in attendance with the Whitechapel fire-escape, and made great efforts to enter the premises, but without success. The Whitechapel engine having been got to work, the fire was soon extinguished, but ere this was accomplished, cries were heard from the basement; Conductor Wood, with assistance, immediately tore up the area grating, and, jumping down, he found a female servant whom he handed up unhurt, the water at the time being over his boot tops. On entering the premises, the lifeless bodies of the three children were found, evidently suffocated in their sleep. The fire was supposed to have originated from a candle-spark dropped among some goods in the shop, late the night before, by the eldest deceased. At the Coroner's inquest, it was shown that all possible exertions had been made to rescue the deceased, but that the circumstances were such as to render them unavailing.

Wednesday, July 2nd, at four o'clock in the morning, a fire broke out in a dancing saloon at the back of the Canterbury Arms Tavern, Woolwich; a constable discovered the fire and gave an alarm. The engines from the Dockyard and Arsenal were brought up and set to work, and the fire eventually extinguished, but not until the saloon had been completely destroyed, the front premises and contents seriously damaged by heat, water, and smoke, and a female, named Trimby, seventy years of age, suffocated.

Friday, December 26th, a fatal fire broke out at Mill's-buildings, Knightsbridge. Mrs. Glide, who occupied the first floor, had put her two children (of the respective ages of 2½ and 4 years) to bed about half-past six o'clock in the evening, and in about an hour afterwards, the house was discovered to be on fire. Great confusion took place, and an ineffectual attempt was made to extinguish the fire, but no effort was made to save the children. The mother said that two gentlemen had told her the children were taken out, and other parties who entered the house had ample time to have rescued the children if they had known they were there. Engines from the barracks and Brigade-stations attended, and the fire was put out. Martin, a fireman, then entered the premises and found a little girl dead in the bed, and under a box he found a little boy who had crept there and covered himself with clothes to avoid suffocation. At the Coroner's inquest the jurors were of opinion, "the deaths were occasioned by fire arising from accident, but they do not feel justified in parting without expressing their opinion, that there was great negligence on the part of the inmates."

Several of the *personal accidents* were of a peculiarly distressing character; one of these occurred at nine o'clock on Sunday morning, July 13th, when Moses London and Ellen Albon were at work at No.

* Only *one* of these fires occurred within the *Royal Society's* districts or hours of duty.

22, Rupert-street, Whitechapel, making water-proof garments; a solution of india-rubber in naphtha took fire, and the flames filled the apartment and enveloped both the inmates. The man ran into the street with his apparel burning, but the female fell down overpowered in the room. Both were taken to the hospital, where they eventually expired.

On the 28th of the same month, a lamentable accident occurred on the premises of Mr. Jaquet, oil and colourman, James-street, Covent-garden. Previous to leaving the shop, Mr. Bennett, the manager, was in the act of emptying the contents of a measure into the turpentine vat, with a candle in his hand, when the spirits took fire and the shop became filled with flame, seriously burning Mr. Bennett, his wife, and three children, who were conveyed to the hospital. After lingering a week in great agony, Mr. Bennett expired; the others recovered. It is a somewhat remarkable circumstance, that of the twenty-one lives lost, two-thirds were children, several of them victims to the practice of "locking in." Such was the case in Long-alley, Finsbury, on the 23rd of April, when Mrs. Zalliudi having occasion to go out, left her three children (females, aged respectively three years, twenty months, and two months) locked up in the second floor front room. It is supposed that one of the children got possession of some lucifer matches and set fire to the bedding. As soon as the fire was discovered, the most praiseworthy exertions were made to rescue the children, and they were all extricated from the burning apartment, but the vital spark had fled; they had died of suffocation, and all attempts at resuscitation proved unavailing.

Another similar catastrophe occurred on the 29th of May, between 11 and 12 o'clock at night, in St. Ann's-court, Soho. It appeared that after putting their two children (Elizabeth Bowler, aged five years, and George Henry Bowler, aged 8½ years) to bed early in the evening, the parents went out to see the peace rejoicings, leaving the children locked in the attic. There was no fire in the room, and only a few lucifer matches, but from some unexplained cause the attic took fire and was burned out before it was discovered, the two children being burned to cinders.

The daily diffusion of last year's fires was as follows:

Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	Sunday.
130	127	157	133	147	121	142

Their distribution through the hours of day and night have been in the following proportions:

	First Hour.	Second Hour.	Third Hour.	Fourth Hour.	Fifth Hour.	Sixth Hour.	Seventh Hour.	Eighth Hour.	Ninth Hour.	Tenth Hour.	Eleventh Hour.	Twelfth Hour.
A.M.	60	61	48	45	28	9	29	16	19	16	25	19
P.M.	24	34	20	19	34	24	62	72	73	82	68	80

The *causes* of fire, so far as could be satisfactorily ascertained, have been the following:

Accidents, unforeseen, and for the most part unavoidable	6
Apparel ignited on the person	3
Areas, lights thrown down	11
Candles, various accidents with	112
,, ignited bed-curtains	24
,, ,, window-curtains	46
Carelessness, palpable instances of	9
Charcoal fire	1
Children playing with fire	6
,, ,, ,, candles	3
,, ,, ,, lucifer-matches	15
Cinders put away unextinguished	10
Coke put away hot	1
Cork, burning of	2
Coppers improperly set	9
Ether, explosion of	1
Fire-sparks	52
Fires kindled on hearths and floors	9
Fireworks, making	1
,, selling	2
,, letting off	3
Flues, blocked up	9
,, defective and overheated	41
,, foul and ignited	19
,, hot-air	3
Friction of machinery	3
Fumigation, incautious	5

Furnaces, overheated, &c.	16
Gas, escape of, from defective fittings ...	53
,, ,, ,, street mains	1
,, left burning too high, or in contact with combustible goods	23
,, accidents in lighting	8
,, fittings, repairing of	2
Gunpowder, explosion of	1
Hearths, defective	4
Hot-plates	2
Hot-water pipe	1
Intoxication	9
Lamps, oil	6
,, naphtha	2
Lime, slaking	11
Linen, drying or airing before fire (upset by cat and dog 2)	43
Locomotive engines, sparks from	4
Lucifer matches, accidentally ignited (by cats 3)	26
,, ,, ,, sun's heat	2
,, ,, making of	5
,, ,, using	6
Naphtha, distilling	2
Oil, boiling	2
Ovens, defective and overheated	9
Pitch and rosin, heating of	5
Plumbers' fires on roofs	2
Reading in bed	1
Shavings, loose and ignited	31
Spontaneous ignition of blue-light powder ...	2
,, ,, flocks	1
,, ,, greasy rubbish ...	2
,, ,, guano	1
,, ,, hay	6
,, ,, lamp-black	2
,, ,, oily cotton	1
,, ,, ,, sawdust	2
,, ,, sugar-bags	1
,, ,, wet shavings... ...	1
Steam boilers, heat from	9
,, ,, explosion of	1
Stoves, improperly set, defective, or over-heated	19
,, drying	12
,, gas...	1
,, ironing	7
,, pipe	6
,, portable	2
Suspicious	27
Tallow, melting	8
Tar, distilling of	3
Tobacco, unextinguished	45
,, pipes and cigars, lighting of ...	5
Turpentine and spirits, drawing off	2
Waterproof composition, heating of	3
Wax tapers	2
Wilful	33
	882
Unknown	75
Total	957

(*To be concluded in our next.*)

MR. MALLET'S WORK ON "THE CONSTRUCTION OF ARTILLERY."*

To the Editor of the Mechanics' Magazine.

Sir,—The calculations which I gave to Mr. Mallet relative to the effects of pressure on a cylinder, and which have since been the subjects of comment both in your Magazine and in the *Civil Engineer*, were not intended to establish any new theory, but merely to apply the commonly received theory to a particular problem. I have never conducted any system of experiments, such as would justify me in propounding a new theory on such a subject—although I am perfectly satisfied that there are many and grave objections to all the existing theories—and therefore I gave the results of my calculations merely as approximations to the truth.

These results were communicated to Mr. Mallet in two letters, in the first of which I only considered the case of a tube constructed in the usual way, and subject only to internal pressure; of this letter you have given a full analysis in pages 104 and 105 of your Magazine.

The second letter (which was written after a considerable interval) gave the calculations for finding the tension when certain other pressures are applied besides that from within; and in this letter I did not use precisely the same notation as in the first. Mr. Mallet has published both letters together, and I believe that the change of notation has caused you to misunderstand the second letter, and to consider it as introducing a new theory.

This second letter was, in fact, divided into four propositions, of which the first was (except for notation) identical with my first letter; the second was to find the ratio of the internal pressure which would burst an ordinary cylinder, to that which it might bear if all its parts were equally strained at the moment of bursting. The third proposition was to find what must have been the tension of the parts before this internal pressure was applied, in order that the application of this pressure might render them equal throughout the mass. And the fourth, to give a practical method of construction by which these tensions might be approximately produced.

Now, whatever theory of elasticity may be adopted, it is plain that each of these questions admits of a clear and definite answer. The theory which I adopted, was recommended by its simplicity, and by its having been sanctioned by many eminent writers on the strength of materials.

The theory preferred by the Reviewer in the *Civil Engineer*, may probably be more correct, but I doubt whether it has yet been established by any accurate experiments, or whether even the ratio of the two co-efficients e and E have been determined for any of the ordinary materials of cylinders. At all events, the effect of adopting this theory would have been to increase the amount of external pressure which I recommended, and I consider it safer to adopt the more moderate pressure, than to have recourse to an extreme force,

* See *Mech. Mag.* for Jan. 24 and 31, 1857, Nos. 1746—7.

on the faith of a crude and imperfect theory.

I fully agree with you that the very great normal compression involved in the construction may be dangerous; but in this, and all practical details, I submit entirely to the metallurgic skill and experience of Mr. Mallet.

With regard to the theoretical objections of the Reviewer, in the *Civil Engineer*, I would merely remark, that his mathematical investigation commences with the three equations, $l = Ec + e\lambda$, $n = Ec + e\nu$, $t = Ec + er$, in which there are seven unknown quantities, l, m, n, c, λ, ν, r, connected by the relation $c = \lambda + \nu + r$, and that a fifth equation is supplied by the known values of n at the outer and inner surface of the cylinder, and a sixth by the condition of continuity; namely, that the difference of extensions of the inner and outer surfaces is equal to the compression of the interval between them. Now, in addition to these, the Reviewer assumes two arbitrary equations, $l =$ constant, $\lambda =$ constant, making eight equations to determine seven unknown quantities!! I forget now whether he omits the equation of continuity altogether, or whether it is by its means that he eliminates E from his result (the very quantity which he blames me for neglecting). One result, however, of these assumptions is, the unlucky equation $n + t =$ constant. And here I must remark, that I never denied the possibility of this equation being true in some particular cases, but that I do deny its being generally true; in fact, as you justly remark, it is true in the case of a tube *subject only to internal pressure;* but it is necessarily false in the case of one subject to *external* pressure, for in this case there is a compression both in the direction of the normal and of the tangents; and therefore n and t have the same sign, and they both decrease from the outer to the inner surface, and their sum cannot therefore be constant. Now, my proposal (on which Mr. Mallet has acted) was to apply a pressure externally by fastening on another cylinder so tightly as to produce a considerable pressure. Again, if there were three concentric cylinders, so proportioned that the inner one should not touch the second until both the second were compressed by the outer one, and the inner one stretched by a considerable internal pressure, it is clear that as soon as contact was thus produced, there would be little or no normal pressure at the surfaces of contact; and yet there would be a considerable extension of one of these surfaces, and compression of the other; so that t would be positive for one surface and negative for the other, while $n = o$ for each; therefore $n + t$, instead of being constant, would suffer a very abrupt change at this point. It would also suffer an abrupt change at the junction of the second cylinder with the outer one, and would vary by different laws in the three cylinders.

Now, Mr. Mallet's "built-up gun" is a combination of this nature, and it is evident that by a suitable variation of pressure of the successive cylinders, any required variation of tension may be obtained. This seems so plain to common sense that mathematical reasoning is unnecessary, except to calculate the exact tensions that will result from given normal pressures.

But to return to the mathematics of the Reviewer: having deemed it necessary to make the two assumptions of the constancy of l and λ, he proceeds to justify these assumptions by proving that l is nearly constant, and leaves the reader to infer from this that λ is also constant. But his first equation shows that this will not follow unless either c is constant, or $E = o$, and these assumptions would destroy the value of his theory of elasticity. I will not occupy more of your space with these equations, for however strange it may appear that any one acquainted with the first principles of algebra should make such blunders, I confess that I was still more surprised when I found that the Reviewer was not startled by the absurdity of his conclusion, that "*in no case do the relative degrees of tension of the built-up gun depend on the tensions with which the rings are successively fastened on;*" this certainly is a climax of absurdity which never could be attained except by a mathematician.

With reference to your remark, that these investigations belong properly to the transactions of a philosophical society, I must beg leave to remind you that Mr. Mallet's essay forms a part of the transactions of the Royal Irish Academy.

I am, Sir, yours, &c.,

A. S. Hart.

Trinity College, Dublin, Feb. 10, 1857.

[The position which we occupy in the discussion to which the foregoing letter refers, is somewhat extraordinary. The greater part of Dr. Hart's letter, as our readers will perceive, is aimed against the review of Mr. Mallet's work, which appeared in the *Civil Engineer and Architect's Journal* of October and November last. We thought that Dr. Hart had met with a scant measure of justice in that review, and on that account referred to it in our pages. A Reviewer has duties to perform towards the public and towards authors, each of them equally important. He is bound to give his conscientious opinion of the value of the information which the work he reviews professes to convey; and on the other hand, he is bound to do justice to the author; not to condemn without reason, and not so to

apportion his condemnation and praise, as to give an undue prominence to the former. Our contemporary seems hardly enough impressed with a sense of his duty in this latter particular. We think that neither Mr. Mallet nor Dr. Hart has received equal justice at his hands; and in a late review of Professor Downing's "Elements of Practical Hydraulics," the same tendency to hyper-criticism has been developed. This work professes to be entirely *practical;* a demonstration, therefore, of the fundamental expression for the velocity of fluids issuing through an orifice, was scarcely to be expected. The demonstration which is given (although certainly faulty) doubtless commended itself to Professor Downing, as being adapted for his purpose by its simplicity, and the sanction of the great name of Newton. The rigid demonstration, as approved by modern science, would have been as unintelligible to a large portion of the class for which the work is intended, as so much Hebrew. In the review referred to, three pages of learned criticism, all tending to the inculpation of Professor Downing, are balanced by one page, containing not one word of praise, but only a quotation, which is given as a fair specimen of the style of the work. Now, we believe Professor Downing's work to be admirable in the *practical portions*, and those are by far the largest part of the book. We strongly suspect our contemporary's acquaintance with the subjects of some of the works which he reviews, to be much more of a theoretical than a practical nature, and this may account for the disproportion of his remarks on theory and practice. This becomes a serious evil when a large portion of the readers of the reviews, being practical men, wish to know if the practical information given by the various authors is to be relied on. We must here express our conviction that the acrimonious tone of Dr. Hart's letter, and his consequent injustice to the Reviewer, might have been avoided, had the latter taken more pains to understand and fairly represent the views he criticizes in the first instance.

To return from this digression to Dr. Hart's letter: we thank him for reminding us that Mr. Mallet's Treatise forms part of the transactions of the Royal Irish Academy. We think that this should have been stated in the title-page, and not left to be inferred from the preface. We will hope, too, that the little slips in mechanics which Mr. Mallet has undoubtedly committed, did not form part of the original paper read before that learned body, which must assuredly exercise some supervision of the papers published under their sanction.

Dr. Hart thinks we have misunderstood his communications to Mr. Mallet, by confining our attention to that contained in his first letter. On comparing our review with the note to Mr. Mallet's work, in which his investigation occurs, he will find that our analysis refers to the *second* of his papers, the method and notation of which we adopted. We of course perceived that the first of the four propositions of the second communication was identical with the only proposition of the first.

Nor did we ever suppose—or intend to convey to our readers the impression—that Dr. Hart's investigation of this proposition possessed the character of novelty, or was founded on any newly discovered theory of elasticity. The only novelty consists in the three latter propositions, to a consideration of which we shall presently recur. We do not blame Dr. Hart for adopting the theory of elasticity which he has made the basis of his calculations. It undoubtedly possesses the recommendations of being simple, and of having been adopted by many eminent mathematicians, and the conditions which are introduced into the solution of the problem by the Reviewer, on the new theory, give it no advantage over that which Dr. Hart adopts. In fact, we have seen that the assumptions made in each of these investigations reduce the final expressions to absolute identity.

Dr. Hart urges as an objection to the rival investigation, that the ratio of the two coefficients e and E have not been determined by experiment. In fact, both of these disappear in the final equation, in consequence of the adopted equations of condition. But neither do k and k' appear in Dr. Hart's own expressions; these too have been eliminated by means of the equations of condition. This objection, therefore, such as it is, lies against his own as much as against the Reviewer's expressions. It is only in the value of the tension of ultimate rupture, which does not at all affect the theoretical expressions, that Dr. Hart and the Reviewer could possibly disagree.

In his criticism of the Reviewer's mode of dealing with his equations we do not altogether agree with Dr. Hart. We allow that the assumption that the tension λ and the corresponding tension l, in one direction are invariable, seems very arbitrary, and we cannot admit much force in the demonstration that is attempted in order to establish their validity. By-the-bye, it is by the aid of these assumptions, and not by the equation of continuity, that e and E are eliminated, and the equation $n+t=C$ results. We cannot allow, however, that the Reviewer has eight equations to determine seven unknown quantities. The known values of n at the inner and outer surfaces

cannot be admitted as giving a condition for determining a relation between the *general values* of the variables in question. A moment's reflection will convince Dr. Hart that he has been too hasty in his statement. The elimination by means of equations of condition of any number of variables generally leaves a differential equation (as in the present instance) for the determination of the variable not eliminated. The *general* solution of this equation gives, of course, only the form of the variable in question, which differs *in value* with the value of the constant or constants introduced in the solution. The known values of the variable under given conditions enable us to eliminate these constants, and obtain the particular equation for the determination of the variable which we require. We have then only seven equations for the determination of the seven quantities, which are all necessary for this purpose. Indeed the same objection would lie against Dr. Hart's own solution. We might, with equal truth, say that he introduces two unknown qualities, P and δ, and has three equations for determining them, viz.,

$$dP+k\frac{\delta}{x}=0 \quad . \quad . \quad . \quad . \quad (1.);$$

$$\frac{P}{x}=-k'\frac{d\delta}{dx} \quad . \quad . \quad (2.);$$

and a third supplied by the known values of P at the inner and outer surface. We are somewhat surprised at such a slip on the part of a mathematician of undoubted power like Dr. Hart.

Again, he states that on the assumption that l is constant, λ cannot be constant consistently with the Reviewer's first equation, $l=e\lambda+Ec$, unless $E=o$, or $c=$constant. But $c=\lambda+\nu+r$; whence $l=(E+e)\lambda+E(\nu+r)$; there is therefore another assumption, namely $\nu+r=$ a constant; and it is this assumption which the Reviewer prefers, and gives rise to the "unlucky" equation $n+t=c$.

We regret very much that Dr. Hart has allowed his judgment to be so warped as to bring these frivolous objections against the Reviewer's investigation, which, on the assumptions he makes, is mathematically unassailable. He certainly does not benefit the cause he advocates by such a course, the error of which is palpable to any one who has an adequate acquaintance with the meaning of mathematical symbols and the modes of dealing with them.

It now only remains for us to offer a few remarks on Dr. Hart's three last propositions which he does not think have been properly understood by us, and reply to his remarks on the equation $n+t=C$.

We stated our opinion that the expressions under these three heads were correct enough, if only the *assumption* on which they were based could be deemed correct. If the tension could, under any circumstances, be uniform throughout the tube, and equal to T the breaking tension; then undoubtedly the equation

$$P=T(R-x)$$

would correctly represent the relation which subsists between the pressure and radius at any intermediate point; and the internal pressure, in this case would be greater than the internal pressure corresponding to the same tension in the former, in the ratio of $R^2+r^2 : Rr+r^2$.

In the *third* proposition Dr. Hart professes to investigate what must have been the original tensions of the several rings, in order to produce the above result. We do not deny that this question, and the fourth which is founded on it, admit of a clear and definite answer. But we do object to the method which Dr. Hart has adopted for obtaining this answer.

He *assumes* that a tube can be constructed of a series of rings in such a manner that, for a given internal pressure, the tension shall be uniform. To find the original condition, he supposes a pressure equal and opposite to the pressure applied in order to remove the internal pressure. To obtain the amount of this negative pressure at any other point, he substitutes its value $-T\frac{R-r}{r}$ for F in the expression

$$P=Fr.\ \frac{R^2-x^2}{R^2-r^2}.\ \frac{r}{x}\ \ldots\ldots\ (I);$$

in other words, he *now* supposes that from the inner to the outer surface, so far as this force is concerned, the equation obtained on the supposition of there being only an internal pressure is applicable, and conjoining this with the assumed expression for the pressure which corresponds to equal tension, he obtains for the actual pressure

$$P=T(R-x)\frac{x-r}{R+r}\ \frac{R}{x}\ \ldots\ldots\ (II).$$

It would not be difficult to show from this expression that the greatest value of P corresponds to the value of $x=\sqrt{Rr}$, and that $t=-\frac{dP}{dx}$ is negative from $x=o$ to $x=\sqrt{Rr}$ and positive from $x=\sqrt{Rr}$ to $x=R$; in other words, since a negative extension is a compression, there is a tangential compression between the former limits, and exension between the latter.

In judging of the correctness of the as-

sumption on which this is founded, the following considerations may be found useful. It would not be difficult to show that if a cylinder be subject to an external pressure, P_1, and no internal pressure, we should have for the pressure at distance x from the centre, using Dr. Hart's own notation,

$$P = P_1 \frac{x^2 - r^2}{R^2 - r^2} \cdot \frac{R}{x} \ldots\ldots \text{(III.)}$$

Also, if t be the extension,

$$t = -\frac{dP}{dx} = -P_1 \frac{x^2 + r^2}{R^2 - r^2} \cdot \frac{R}{x^2} \ldots \text{(IV.)}$$

Also,

$$-n = -\frac{P}{x} = -P_1 \frac{x^2 - r^2}{R^2 - r^2} \cdot \frac{R}{x^2} \ldots \text{(V.)}$$

It appears from (IV.) that the value of t being negative, the cylinder is compressed in the tangential direction. Also,

$$t - n = -\frac{2P_1 R}{R^2 - r^2}, \text{ a constant quantity (VI.)}$$

Again, if a cylindrical shell be subjected to two pressures, viz., P_1 at the outer and P_2 at the inner surface, we obtain the equations

$$P = P_2 \frac{R^2 - x^2}{R^2 - r^2} \cdot \frac{r}{x} + P_1 \frac{x^2 - r^2}{R^2 - r^2} \cdot \frac{R}{x} \ldots\ldots \text{(VII)}$$

$$t = -\frac{dP}{dx} = P_2 \frac{R^2 + x^2}{R^2 - r^2} \frac{r}{x^2} - P_1 \frac{x^2 + r^2}{R^2 - r^2} \cdot \frac{R}{x^2} \ldots\ldots \text{(VIII)}$$

$$\text{Also, } -n = -\frac{P}{x} = -P_2 \frac{R^2 - x^2}{R^2 - r^2} \cdot \frac{r}{x^2} - P_1 \frac{x^2 - r^2}{R^2 - r^2} \cdot \frac{R}{x^2} \ldots \text{(IX)}$$

$$\text{Whence also } t - n = \frac{2P_2 r - 2P_1 R}{R^2 - r^2}, \text{ a constant quantity } \ldots\ldots \text{(X)}$$

Whence we draw the inference that, whether the cylinder be subject to an internal or an external, or to both an internal and external pressure, which are all the cases that can occur in practice, $t-n$, is constant. We observe that we must not take $-t-n$, because in *the investigation* t is supposed to be an extension, and the sign in the result shows whether it is an extension or compression.

Now no cylinder or shell can practically be subjected to other forces than these; hence it appears that, notwithstanding Dr. Hart's *à priori* objections, the equation $n + t = C$ does hold for all possible cases of *continuous* shells.

Reverting to the case of Dr. Hart's second proposition, where the extension on the application of the internal pressure is supposed uniform, we have

$$P = T \frac{(R-x)(x-r)}{R+r} \cdot \frac{R}{x} \text{ from (II)}$$

$$\text{and } t = -\frac{dP}{dx} = T \cdot \frac{x^2 - Rr}{R+r} \cdot \frac{R}{x^2} \ldots\ldots \text{(XI)}$$

$$-n = -\frac{P}{x} = -T \cdot \frac{(R+r)x - x^2 - Rr}{R+r} \cdot \frac{R}{x^2} \ldots\ldots \text{(XII)}$$

$$\text{whence } t - n = T \cdot \frac{2x - (R+r)}{R+r} \cdot \frac{R}{x} \ldots\ldots \text{(XIII)}$$

This is a quantity which evidently has its least value when $x = r$, and increases gradually to the outer surface. So long, therefore, as the magnitude of the rings of which the gun is composed is finite, the condition of uniform extension throughout is impossible. Dr. Hart and Mr. Mallet propose four rings, each of the breadth of one-half the bore. It is then impossible that this condition can be fulfilled through the extent of the several rings. There can be but one point, or rather one cylindrical surface in each ring, where, by apportioning the pressures at its inner and outer surface, it is possible to obtain a tensile force corresponding to that of greatest extension, should the physical conditions allow of such a result.

Having thus cleared away all the extraneous considerations which have been introduced, and shown wherein Dr. Hart's objections to our contemporary's mathematics are untenable, also how far it is true that $n+t$ can be considered as variable (it being constant for each shell, its value depending in all cases on the outer and inner radius, and the pressure on the terminal surfaces), it now remains to consider the main question, whether in the case of several concentric shells, it is possible, by shrinking on some of these, to vary the terminal pressures and extensions of the cylinders *ad libitum*.

Dr. Hart's remarks on this point are entitled to great respect; but we do not think they are conclusive, for they stop short just at that point at which the real conditions of the built-up gun come into play.

In the case of the three concentric cylinders put by him, it is very possible that

there might be very considerable extension of one and compression of the other at the surfaces in contact, just at the moment contact began, and before normal pressure was produced; and this state of things might continue, if no further extension of the one or compression of the other took place. Supposing, however, these had not reached their limits, and a normal action were to commence, the compression of the one and the extension of the other would be immediately checked, and the normal force consequently would be increased from this cause. Now, at what point is this mutual action to cease? This is the real question in dispute. The Reviewer in the *Civil Engineer* is of opinion that it will go on until the whole of the successive rings have accommodated themselves to the circumstances of a single tube, acted on by an external force corresponding to the tension of the upper film. Dr. Hart maintains a contrary opinion; but there is nothing to show, in his account of the matter, what is the limit to which this normal action proceeds. It must also be remembered that in the case of the built up gun, there is no pretence that the rings are so proportioned as *not to be in contact* before the internal pressure is applied. In fact, the compression of the inner rings is entirely due to the normal pressure produced by the extension of the outer rings. Suppose now the last ring is just shrunk on and cooled down; it grasps the ring next below it, and produces on it a normal pressure which tends to *compress it;* and since it is already in a state of extension, this amounts to relieving it of a portion of this extension, and hence, the next ring, and all in succession, being relieved at first of a part of the pressure on them, tend to dilate. This tendency being checked, an increase to the normal pressure is produced from the inner through the successive rings to the outer. This must, of course, increase the extension of the outer ring; and by virtue of this extension the action we have pointed out will be repeated. We confess that we do not see where this action is to stop short, until the pressures at the surfaces of the successive rings have accommodated themselves to the case of a continuous tube acted upon by a normal pressure, due to such an extension of the outer ring as corresponds to the sum of the extensions due to the forces produced by the successive shrinkings on. This is probably the true explanation of Mr. Mallet's observation, that the process of forming a gun on the principles advocated "has been actually found to be attended with as little difficulty as the shrinking on of the tyre of a railway wheel."(P.266.) For these reasons we are inclined, as far as we can see at present, to the Reviewer's view of the case. We do not pledge ourselves to this opinion, for our view of the physical conditions of the problem may possibly be materially affected by further argument.

Dr. Hart has allowed himself to hazard rash and ill-founded objections against the investigation which started up in rivalry to his own. *Possibly* he may have adopted his present view of the effect of shrinking on successive rings without sufficiently mature reflection; and if he extends his consideration to the case where mutual normal action takes place, at which he now stops short, he *may* find it necessary to modify his theory.*—Ed. M. M.]

CORT'S INVENTIONS.

Copy of a Letter addressed to the Editor of the Mechanics' Magazine *by W. Truran, Esq., Author of a work on "The Iron Manufacture of Great Britain," &c. &c., and formerly Engineer of the Dowlais, and the Hirwain and Forest Iron Works.*

Marazion, Cornwall, Jan. 30, 1857.

Dear Sir,—I am favoured with yours of the 26th, also the specifications of Cort's patents, for which I have to thank you. I should have noticed your queries sooner, but the making of some designs for rolling mill engines for Wales has greatly curtailed my leisure, added to which, the recent severe weather affects me severely.

By the publication of the specifications Cort's claims on the nation appear in a much stronger light than previously; for, as we now learn, his inventions in iron manufacturing were not limited to *puddling* and *grooved rollers* alone. He appears in the specifications as the inventor of the piling and heating process of the modern rolling mills. His description of the great advantages which a reverberatory furnace has over a hollow fire, or chafery, in bringing large masses to a welding heat, proves him to have been a thoroughly practical man. The mode of piling iron to form large pieces, as described in his specification, is the one in use at the present day.

1. The method of puddling iron now in use is the same as that patented by Cort. There has been no essential departure from his process. Iron bottoms have been substituted for sand; and by building the furnace somewhat longer, a second charge of cast-iron is introduced and partially heated during the finishing operations on the first, so as to economise time and fuel; but Cort's description of the process, as conducted by

* We think it only fair to Dr. Hart to state that, before going to press, we have received from him a Postscript cancelling a portion of the contents of his letter. This shall appear in our next.

him, applies without any variation to the process as conducted at the present day. All that has been done in the last seventy-three years has been in the way of adding to, and perfecting Cort's furnace, as experience has, from time to time, suggested. Mr. Bessemer professed to dispense with Cort's puddling process, but hitherto he has failed to do so.

2. The profit on manufacturing is not great. Taking the average of a number of years, it will not amount to more than 12s. per ton. I have known periods when £3 to £3 10s. has been realized over the cost of manufacturing; but on such occasions prices quickly recede, and long periods of depression follow, with iron selling at cost price. In estimating the value of Cort's inventions I do not think we ought to look to the profits of the manufacturers engaged, for it is a question whether they realize more than a fair return for the capital invested. Many of the iron masters are rich, but their wealth has been accumulated slowly; and the trade is, and always has been, in the hands of a sufficient number of men to create a keen competition.

I would rather see the Cort case treated as an affair of the nation's than as a claim against the ironmasters. The ironmasters have not benefited by his inventions to a greater extent than others. Cort's inventions reduced the cost of making malleable iron and parallel-shaped bars several pounds per ton, but with the general use of his inventions the price of bars fell nearly one-half, thus benefiting all classes alike.

In fact, the ironmasters seem rather to have encouraged Cort's inventions. The circumstance of several manufacturers agreeing to pay him 10s. per ton royalty shows that thus early they appreciated his plans, and were willing to meet him on liberal terms. Subsequently the patents were seized by Government for the defalcations of his partner, and locked up for the remaining years; but this injustice, the injustice for which compensation should be awarded, was not, so far as we can see, the work of the ironmasters.

3. The "finer's metal process" is still partially used in Dowlais Cyfarthfa, and a majority of the Welsh works. Probably a moiety of the iron converted is so heated; but in Staffordshire, Shropshire, Derbyshire, Yorkshire, and the north, the number of refineries at work is very small indeed. Besides, it is to be borne in mind, that the "finer's metal process" is merely an intermediate process between the blast furnace and Cort's puddling furnace. Whether the refining be used or not, Cort's puddling process is resorted to in manufacturing every pound of the present large annual make of bar-iron in Great Britain.

4. For each blast furnace in this country there are 7 puddling and 4 balling furnaces of the construction patented by Henry Cort. (The numbers stand thus:—9 firms converting their pigs into bars have collectively 84 blast furnaces, 567 puddling, and 348 heating or balling furnaces.) In Staffordshire and Shropshire the proportion of puddling furnaces to blast furnaces is much larger; but since Scotland and the northern districts are more sparingly supplied, the proportion above will be near the mark. Altogether there are about 8,200 of Henry Cort's patent furnaces in Great Britain.

If these few remarks are of any use, they are at your service for use in any way you think proper. I think that if the thing was mooted and well started, the ironmasters and engineers of the country would contribute sufficient to provide a colossal iron statue of Henry Cort, to be erected in a suitable place. The cost would not be great. A single casting of 80 or 90 tons would not cost more than £2,000. Compensation to his family ought to emanate from Government. I am, dear Sir, yours truly,

WILLIAM TRURAN.

STREET RAILWAY TRANSIT.

A paper on the application of rails for horse transit in the streets and environs of London, and also for railway branches, was read on Wednesday, Feb. 11, at the Society of Arts, by Mr. W. Bridges Adams, who first mooted the application of rails to common roads in this country, many years since, and who has constantly advocated the system subsequently, both in print and in words. About the year 1843, he wrote an article in the *Westminster Review*, in which he advocated laying down rails in streets, flush with the surface. In 1845, he advocated the same general system. In 1849, he published a pamphlet, entitled, "The Iron Ways," which was reviewed in the *Times* and *Spectator*, and the railway periodicals. In January, 1850, he published a little work, entitled "Road Progress, the Amalgamation of Railways and Highways for Agricultural Improvement and Steam Farming;" treating of highways, railways, steam-carriages, turnpike roads, railway wheels and farm railways; and in December, 1850, he read a paper, advocating the system, before the Society of Arts. He has had many plans of structure with rails made on purpose, but it has recently occurred to him that the existing rails of railways worn out by the locomotive are perfectly well adapted to street use, and would afford great strength at low cost. There are two proposals, — either to adapt the street rails to the wheels of the ordinary omnibuses and cabs, or to adapt them to a

special form of wheel tyre. For ordinary wheels, his plan is as follows:—The common double T rail used on the narrow gauge railways is 5 ins. in height, and 2½ ins. in width. In practice, the wheels of the locomotives with six tons dead weight on them, abrade the upper surface, while the lower surface is damaged in the chairs. But the side channels remain intact. He therefore proposes to take the rails and lay them down flat, bolting them at the joints to a block of cast iron through the fish bolt holes, the same block being provided with a horizontal hole, in which is received a tie or gauge bar, connecting the two opposite rails together. In the channels of these rails the ordinary omnibus wheels can run, and, supposing the gauge the same, ordinary railway waggons could run equally well, the wheels running on their flanges instead of their tracks. As dirt may get into it, a spring scraper may be attached to the vehicle; or smart lads from the red or blue shoe brigade might be selected and provided with a crooked stick each to patrol the line. Ordinary omnibuses running on these rails would be in no difficulty; they can easily be turned out of the rail channels, without points and crossings, or any expensive paraphernalia. There is another rail also well adapted to the same purpose, and possessing greater lateral and vertical strength for this purpose,—the bridge rail. For street and road purposes it is to be reversed, with the groove above, resting on the bottom and the side flanges. The wheels to run on this kind of rail will require flanges in the centre of the breadth of the tyre. A spring scraper will keep the grooves clean, or a boy can be employed. All the other arrangements will be the same as with the double T rail.

PATENTS FOR THE MANUFACTURE OF ENVELOPES.

COURT OF QUEEN'S BENCH, GUILDHALL, FEB. 13 AND 14.

(Sitting at Nisi Prius, before Lord Campbell and a Special Jury.)

DE LA RUE AND OTHERS V. DICKENSON AND OTHERS.

SIR F. THESIGER, Mr. Grove, Q.C., Mr. Hindmarch, and Mr. Lush appeared for the plaintiffs; Mr. Serjeant Byles, Mr. H. Hill, Q.C., Mr. Bovill, Q.C., and Mr. Webster for the defendants.

The plaintiffs in this action were Messrs. De la Rue and Co., the well known manufacturers of envelopes, and the defendants, Messrs. Dickenson and Co., were gentlemen engaged in the same department of manufacture. The action was directed by the Court of Chancery to try the question whether the method of making envelopes adopted by the defendants was an infringement of the plaintiffs' patent of 1845, or of that obtained by him in 1849.

It appeared that on the 28th of August, 1849, a Frenchman, named Amédée François Remond, had taken out a patent for "improvements in machinery for folding envelopes, and in the manufacture of envelopes;" and the defendants had been induced, in November, 1850, to purchase the patent of Remond, for about £3,000, on the assurance that it could be worked without infringing on the plaintiffs' patents.

It was now represented that the use of this invention was an infringement of the former patents. Several scientific witnesses were examined in support of this view of the case, including Mr. De la Rue (the plaintiff); and afterwards several witnesses were called for the defendants, including Mr. Applegath (to whom Lord Campbell paid a handsome compliment for the services rendered by him to the public, which his Lordship said we all enjoyed), and Mr. Dickenson (the defendant). These gentlemen stated that, in their opinion, Remond's invention was totally different from the plaintiffs'; and, in fact, had nothing analogous in it.

A good deal of evidence was also given respecting the gumming processes adopted by the manufacturers.

It is but right to say that, whatever might be the case in regard to the defendants' machine being an infringement of the plaintiffs' patent, it seemed to be admitted that it was a meritorious machine, and much more simple in its construction than the plaintiffs', and more effectual in its operation. The trial having lasted two whole days,

Mr. Serjeant Byles summed up the evidence for the defendants, and

Sir F. Thesiger replied generally upon the whole case.

Lord Campbell then summed up the evidence to the jury, and, in so doing, advised the jury not to be carried away with the idea that, as there was great merit in both, they should both remain as they were; but they must say whether or not, in their opinion, the defendants' process was substantially the same as the plaintiffs'.

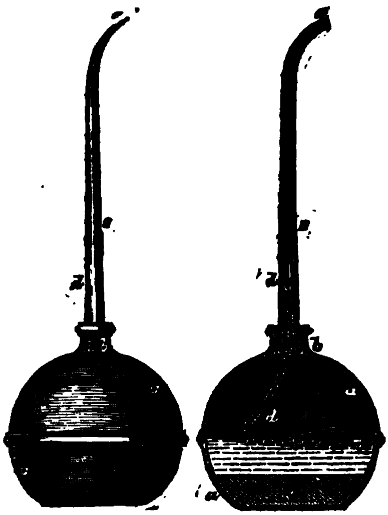
The jury found a verdict for the plaintiffs on both points, stating that the defendants' was a colourable imitation of the plaintiffs' process.

Lord Campbell gave the defendants' counsel leave to apply to the Court above on a point of law which his Lordship had decided unfavourably to the defendants.

FENN'S PATENT OIL CANS.

Mr. Fenn, the well known tool manufacturer of Newgate-street, London, has patented an improved oil-can, which deserves to be brought into use wherever machinery has to be lubricated, and similar operations

Fig. 1 Fig. 2.



performed. It has the merits, first, of always maintaining itself in an upright position; and, secondly, of allowing the oil to flow freely from it. The above engravings represent the improved can, fig. 1 being an outside view of it; and fig. 2 a vertical section through the middle of it. *a* is the body of the can, which has soldered upon the top of it a ring, *b*, with an internal screw thread. Into this screw the outflow-pipe, *c*, which has fixed near the bottom of it, and opening through it, an air-tube, *d*, on that side of the outflow-pipe, *c*, which is opposite the outlet, so that when the oil is poured out, the air tube aperture may be on the upper side of the outflow pipe. The air entering through this tube, *d*, presses upon the oil within the vessel, and keeps up a steady and continuous outflow. The tube, *d*, is curved as shown, in order that the oil may fall clear of it, and not enter it when the can is inclined. *e* is a quantity of lead, by the gravity of which the can, however placed down, will be brought into an upright position. It is evident that the arrangement of the parts, as well as the materials of which the vessel is composed, may be varied, the characteristic features being retained. The same principles of construction may also be applied to other vessels. As we before remarked, the improved can, the cost of which is small, merits a very extended adoption.

Rudimentary Treatise on the Law of Contracts for Works and Services. By David Gibbons. *Second Edition.* London: John Weale, 59, High Holborn, 1857.

This is a very valuable little treatise, giving, in an agreeable and lucid form, a summary of the existing laws by which the contracts formed between employers and the employed are regulated. The law, in almost all cases, is illustrated by examples drawn from the decisions given in cases which have from time to time been made the subjects of judicial investigation. The book is one which the working classes, as well as masters, would do well to study, and which, from its low price, is within the reach of all.

STEAM SHIP ARITHMETIC.

To the Editor of the Mechanics' Magazine.

Sir,—I will thank you to notice an error in print in my letter on "Steam Ship Arithmetic," No. 1749, page 157, line 38, viz., for highly "*loaded*" vessels read highly "*lauded*" vessels, rendering the sentence as follows: "The neglect of all tests of dynamic duty, such as that afforded by the coefficient or index number deduced from the formula referred to has ruined many a steam ship enterprise through the employment of highly *lauded* vessels, that ought not to have been sent to sea; and if not ruined, the public have had to pay the cost."

The press of the *Mechanics' Magazine* being now closed on the subject of "Tonnage and Shipping Registration Amendment," agreeably to your Editorial article of 14th instant, and your readers having been already referred to my original papers thereon, as published in the *Journal of the Society of Arts*, January 18, 1856, I am quite satisfied to leave the matter in their hands, and I beg to thank you for the liberal use that has been made of the *Mechanics' Magazine* in bringing this subject before the public.

I remain, Sir, yours, &c.,

Charles Atherton.

Woolwich Dockyard, Feb. 17, 1857.

[We have in type the reply of "A Mechanic" to Mr. Atherton's letter on the above subject given in our last Number, but cannot find space for it this week.—Ed. M.M.]

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Newton, A. V. *An improvement in projectiles for ordnance.* (A communication.) Dated June 10, 1856. (No. 1381.)

To the butt of an elongated cannon shot (or shell) is attached a cup-formed cylinder of wrought iron, fastened to the body of the shot, while its sides project beyond the butt, and are so thinned down as to be capable of such expansion by the explosion of the charge as to fit the bore, thus saving windage, and imparting rotary motion when rifle grooves are employed.

Wilson, W. *Improvements in machinery for pulling the hair from coney and other skins.* (Partly a communication.) Dated June 10, 1856. (No. 1382.)

The patentee makes machinery which acts in a similar way to the workman, who takes the fur between his thumb and the pulling knife in his hand, and thus pulls off this hair.

James, H. B. *Improvements in moulding metallic castings.* Dated June 11, 1856. (No. 1383.)

Railway chairs, or other castings with counter-sunk or other holes or cavities therein, of any form or shape, are moulded by attaching to the pattern "shifting pieces," which are left on the cores after the pattern is withdrawn, and subsequently removed.

Westwood, W. H., and T. and E. Wright. *An improved stop or regulating valve.* Dated June 11, 1856. (No. 1384.)

This consists in an arrangement of the internal parts of the chamber or valve-box, for securing accurate fitting surfaces, an easier opening or closing of the passage ways, and less risk of leakage.

Bayliss, W. *A new or improved manufacture of ornamental metallic tubes.* Dated June 11, 1856. (No. 1385.)

Claim—Manufacturing ornamental metallic tubes by pressing a plain tube upon a mandril having upon it the ornamental figure to be given to the tube, the said ornamental figure being such as will permit of the withdrawal of the mandril from the tube.

Johnson, J. H. *Improvements in the manufacture of safety paper.* (A communication.) Dated June 11, 1856. (No. 1386.)

The objects are the avoidance of chemicals injurious to health; the preparation of the paper so that inks will penetrate through it when attempted to be removed by chemical means, and so that the chemicals employed will leave indelible marks; the preparation of the paper so as to prevent any transfer of writing or printing from the paper; the preparation of paper for bills, cheques, &c., so that it cannot be tampered with prior to actual use. A solution, either of iodide of potassium, iodide of ammoniacal sodium, bromide of the same ammoniacal bases, or of any salt or matter which contains iodine or bromine is employed. This is introduced into the pulp; or, if used in a thick state, may be applied to the paper.

Combe, J. *Improvements in machinery for carding and roving tow, and other fibrous substances, part of which improvements is applicable for transmitting motion in other mechanism.* Dated June 11, 1856. (No. 1387.)

Claims.—1. Applying to carding engines transverse sheets of gills or their equivalent, for delivering the material from the doffer, with the fibres arranged more perfectly than usual. 2. Covering the wood stones in which the card teeth are fixed with metal, for giving strength, smoothness, and retaining power. 3. Two arrangements for improving the take-up motion in roving frames. 4. Constructing expanding pulleys with interlocking parts, and applying same to roving frames, &c. 5. A mode for communicating motion from the differential wheel to the bobbins. 6. A mode of constructing the bobbin lifter.

Newton, A. V. *Improvements in breech-loading fire-arms.* (A communication.) Dated June 11, 1856. (No. 1388.)

1. A moveable breech-piece is constructed to form, when desired, an open funnel leading into the rear of the barrel for loading, and afterwards to close and constitute a tight breech to the barrel. In closing it forces the cartridge to its place, and shears off the rear end to leave the charge exposed to the fire of the priming. 2. A compound lever operates the breech-piece. 3. Means are provided for adjusting the breech-piece, and removing it for cleaning. 4. The rear end of the barrel is formed with an elastic flexible lip all around to be driven back against the breech by the explosion, making a tight breech. 5. The construction of rifle grooves is improved. 6. A primer is used containing a ribbon priming, and mechanism for conveying it over the nipple or vent. 7. The hammer and breech-piece work on the same imaginary axis, so that, after the fall of the hammer it rises, remains on the nipple or vent when the breech-piece is raised to reload, and descends again when the breech-piece is let down again, thus obviating the necessity for cocking and applying the priming until it is required to fire, and the hammer always keeps the priming-box closed against rain until it is time to fire.

Brooman, R. A. *Improvements in the manufacture of spoons, forks, and other similar articles, and in the machinery employed therein.* (A communication.) Dated June 12, 1856. (No. 1389.)

A block is cut roughly out of a strip of rolled metal, shorter and narrower, but thicker than the spoon (or other article), and so that but little material is wasted. It is then brought to the desired length and breadth through rolls. To give the bowl shape, and to engrave the article, it is passed through rolls with suitable patterns engraved on them.

EIVES, J. *Improved machinery for extracting oil from oleaginous seeds.* (A communication.) Dated June 12, 1856. (No. 1390.)

The seeds are placed in the crushing apparatus, thence pass through pressing machinery, to extract the oil, thence into a heating and reducing apparatus, and thence to machinery which takes out the remaining oil (called hot-pressed oil). The oil cake now passes under a knife, which cuts it up to be removed.

UNWIN, P. and J. *Improvements in the manufacture of pen and pocket knives.* Dated June 12, 1856. (No. 1392.)

The "bolster" and scales are formed of one piece of material without a covering of horn, ivory, &c.

FAIRCLOUGH, J. *An improved expander and contractor for dining tables.* Dated June 12, 1856. (No. 1394.)

This consists of cross (lazy-tongs) levers arranged horizontally beneath the top of the table, and with which may be combined, if preferred, the telescope slides now in use.

STENHOUSE, J. *Improvements in the preparation of a discolouring material suitable for the treatment of acid, alkaline, and neutral solutions.* Dated June 12, 1856. (No. 1395.)

This invention will be described in an early Number.

MASSEY, W. *Improvements in looms for weaving.* Dated June 13, 1856. (No. 1399.)

To prevent the shuttle flying off the race board during the weaving, an elastic band or strap is fixed the whole length of the stay, in such a position that if the shuttle has the least tendency to fly off, it will immediately come in contact with the said band or strap, which will prevent it.

DUMERY, C. J. *Improvements in machinery to be used for manufacturing shoes and boots.* Dated June 13, 1856. (No. 1400.)

Boots and shoes are manufactured with screws without heads, by means of a series of machines, which cannot be described without illustrations.

JONG, S. DE. *Improvements in warming and ventilating apartments and buildings.* Dated June 13, 1856. (No. 1404.)

Air is heated by passing from the exterior of the building through a suitable channel into a heating chamber, and thence by channels under the floor of the apartment to be warmed, in which floor are valves or ventilators. There are other valves in the floor for leading the air in the apartment to the ash-pit of the fire which heats the heating chamber. In the ceiling are to be other valves communicating with the chimney.

JACOT, W. *Improvements in fire-arms.* (A communication.) Dated June 13, 1856. (No. 1405.)

The locks of fire-arms are so arranged that the piece may be cocked by pressing upon the trigger guard. One end of the guard is centered to the plate of the lock, and the other rests on the tail of the hammer. A tooth on the trigger falling into a notch on the trigger guard, retains the hammer when raised, and when the trigger is pulled the tooth is withdrawn, and the hammer descends.

FONTAINEMOREAU, P. A. L. DE. *Certain improvements in ship building.* (A communication.) Dated June 13, 1856. (No. 1406.)

These improvements comprise certain modes of constructing keels and hulls of ships, which cannot be described without illustrations.

MEGE, H. *Improvements in the manufacture of bread.* Dated June 14, 1856. (No. 1407.)

White bread is to be made from substances which now produce but brown bread, by the application of vinous fermentation produced by alcoholic ferment or yeast; the thorough purification of the flour by the sifting of the farinaceous parts from the fragments of bran disseminated by the millstone; &c.

FONTAINEMOREAU, P. A. L. DE. *Certain improvements in metallic packing for stuffing boxes and pistons.* (A communication.) Dated June 14, 1856. (No. 1411.)

This packing consists of metallic rings, formed of segments, and acted upon by springs.

SEED, W. *Certain improvements in "lap machines," or apparatus used in the preparation of cotton and other fibrous [illegible] spinning.* Dated June 14, 1856. (No. [illegible].)

These improvements are for causing the lap machine to form the pressed lap or fleece of cotton, &c., of a perfect quality throughout, and of the same density at its last coil—that is, at its largest diameter—as at its first, 1. by gradually diminishing the pressure upon the axis of the lap rollers (where weights are used), as the winding on approaches completion; 2. by the use of a differential motion for actuating the fluted feed rollers, so as to apply a larger proportion of cotton as required by the increasing diameter of the lap, and for decreasing the

speed of the lap roller to allow it to wind on at its largest diameter without subjecting it to distension or attenuation.

LINDNER, E. *Improvements in breech-loading fire-arms.* Dated June 14, 1856. (No. 1415.)

A moveable breech is fitted at the rear of the barrel, so that the force of the explosion acts on the parts that hold the breech down. All moving parts exposed to the fire are packed with asbestos.

SUTCLIFFE, J., and J. LEECH. *Improvements in machinery or apparatus for opening, cleaning, and preparing cotton, wool, and other fibrous substances.* Dated June 16, 1856. (No. 1416.)

A toothed roller or shaft with ratchet wheels, grooves, or teeth (stationary or revolving), is placed under the ordinary feed rollers of the willow or scutcher. The wheels, grooves, &c., pass between the teeth of the revolving cylinder of the willow, or between pegs or teeth placed upon the bars of a scutcher beater.

DESNOS, C. *Improvements in furnaces for consuming smoke.* (A communication.) Dated June 16, 1856. (No. 1417.)

The ash-box or pit of furnaces is so enclosed that air is impelled by the chimney draft to enter the furnace quickly, and advantage is taken of the low-air pressure above the fuel to draw the gases resulting from the distillation of the coals together with the fresh air through the carbonised fuel.

GUERIN, E. *A self-acting apparatus for working railway brakes.* Dated June 16, 1856. (No. 1418.)

The pressure exercised on the buffer springs when the driver shuts up the throstle valve, and tightens the brake of the tender, is rendered available to lock up all the wagons provided with self-acting brakes.

BARLOW, W. H., and W. H. WOODHOUSE. *Improvements in connecting and securing the ends of rails of railways.* Dated June 16, 1856. (No. 1419.)

The chairs employed are in two parts, with the interior formed to receive two fish plates in addition to the rail. A screw bolt passes through the two jaws of the chair, the rail, and the two fish plates. Joint chairs are made wide, and have two holes through each of the jaws for screw bolts, so that one bolt passes through the end of each rail. The fish plates are also bolted to the rails by other screw bolts, and when using fish plates in connecting the ends of rails of railways, plates with female screws therein are used in place of separate nuts for each screw bolt.

MANNIX, J. B. *A method of applying locomotive power to the working of inclines.* (A communication.) Dated June 16, 1856. (No. 1420.)

A rope (or chain) is secured on each side of the rails by tightening screws and fixed piers at each end of the incline of the permanent way, so as to pass round tightly upon the peripheries of the driving wheels (or duplicate wheels on the driving shaft), the slipping of the wheels being prevented thereby.

DAVIS, J. *A new and improved method of manufacturing the small coke, commonly called breezes, which said method of manufacturing economizes heat, and effects the suppression or partial suppression of smoke.* Dated June 17, 1856. (No. 1424.)

The oven in which the breezes are made is combined with a furnace, so as to economise the heat produced.

HOLLAND, H. *Improvements in the manufacture of umbrellas and parasols.* Dated June 17, 1856. (No. 1425.)

Umbrella and parasol tubular ribs are made by reducing the thickness of the strip of steel in all parts, excepting that from which the joint is to be made, and afterwards expanding laterally the part from which the joint is to be made by pressure, and forming the whole into a tube, excepting that part, that being folded into two parallel portions to form the stretcher joint. The invention also comprises machinery.

SADLER, J., J. GREEN, and T. DAVIS. *Improvements in the manufacture of hinges.* Dated June 17, 1856. (No. 1426.)

1. The curved surfaces of the joints of hinges are finished by bringing the joints under the operation of a cutter to which a helical or cork-screw motion is communicated. 2. The edges of hinges are finished by subjecting them to the operation of a cutter to which a reciprocating rectilinear motion is communicated.

BAYLIS, A. G. *An improvement or improvements in needles.* Dated June 17, 1856. (No. 1427.)

An elliptical or nearly elliptical edge is combined with a depression, groove, or gutter in the body of the needle running into the eye.

EIVES, J. *An improved dynamometer.* (A communication.) Dated June 17, 1856. (No. 1428.)

This instrument is composed of two parts—the measuring apparatus, and the registering apparatus. The former is similar to some dynamometers heretofore contrived, and the latter consists of a counter similar to those employed in ordinary gas meters, but is so controlled by the measuring apparatus that its indications depend in part upon the velocity of the rotating shafts to which the instrument is applied, and in part upon the force exerted, as indicated by the relative change in the position of the parts of the spring connection of that apparatus.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

SMITH, W. *A material for the destruction of flies, gnats, and other insects.* (A communication.) Dated June 9, 1856. (No. 1371.)

The material named is paper made from pulp steeped in a solution destructive to insect and not to human life, with sugar and honey added.

BROOMAN, R. A. *Improvements in ladies' wearing apparel.* (A communication.) Dated June 9, 1856. (No. 1372.)

Tubes of caoutchouc or crinoline are connected to the skirts of petticoats, &c., by hooks and eyes, buttons, or laces. These tubes may be stiffened by the insertion of wire or cane. Or tubes of thin air-proof material may be fastened to the skirt at intervals, and inflated. Or two pieces of tape may be sown in the skirt with eyelet holes in their edges to receive and lace the tube.

WAGNER, H. *Improvements in beds and mattresses and similar articles of bedding.* Dated June 10, 1856. (No. 1374.)

Perforated or reticulated surfaces are applied in the ticking, whereby air has free ingress to or escape from the feathers, hair, or other stuffing.

BROOKES, W. *Improvements in the treatment of corn.* (A communication.) Dated June 10, 1856. (No. 1376.)

These relate to the removal of the husks from the grain. The corn is first subjected for a short time to the action of water acidulated by hydrochloric acid to loosen the husks. To prevent discoloration, the inventor mixes with the solution hyposulphite of soda. Rubbing surfaces are obtained by a fixed table grooved in its upper surface, upon which is placed the corn. Upon this are other surfaces, which rotate each upon its own, as well as round a common centre, and there are scrapers which place the corn acted upon by one rubber in position to be similarly operated upon by the next. The rubbers are faced with vulcanised india-rubber. By these rubbers the husks are removed.

CHESHIRE, C. R., and J. BETTELEY. *Improvements in the manufacture of anchors.* Dated June 10, 1856. (No. 1379.)

Anchors having a joint connecting the shank to the arms, have the arms formed of solid iron, with a hole in the centre for the shank to pass through. The shank and arms have enlargements on the throat or crown end, to prevent the arms from resting on the shank. It is also proposed to make arms of two tenoned pieces, each piece forming a complete arm with its palm.

HARDWICK, P. W. *An improved manufacture of tickets for railway and other uses.* Dated June 12, 1856. (No. 1391.)

Upon tickets as they are issued are to be stamped any arbitrary signs indicating the age, sex, and chief peculiarities of the purchaser.

SPILL, D. *Improvements in purifying spirits of tar or coal tar naphtha.* Dated June 12, 1856. (No. 1393.)

Spirits of tar or coal tar naphtha, previously rectified, are passed, while in a state of vapour, in contact with the lime to deodorise them, or remove their smell.

LEWSEY, C. J. *Improvements in sugar cane mills.* Dated June 12, 1856. (No. 1396.)

In lieu of the large "side frames" or standards of cast iron heretofore used, wrought iron standards composed of numerous plates are employed.

STOTT, G. L. *Improvements in purifying gas.* Dated June 12, 1856. (No. 1397.)

The gas is passed over or amongst oxide of zinc, or the carbonate of the oxide, whereby the sulphur contained in the gas is caused to combine with the metallic zinc, forming a sulphide of that metal, and the oxide of zinc may be reproduced by roasting the resulting sulphide in a current of air, or otherwise, and us d again.

COWBURN, T. *Improve ents in valves for reducing the pressure of ste m or other liquids or fluids.* Dated June 13, 1856. (No. 1398.)

This consists in the pplication of two valves on one spindle, one larger than the other. Rods, weights, and springs are also combined therewith.

WHITMORE, W. R. *Improvements in multitubular steam boilers.* Dated June 13, 1856. (No. 1401.)

The inventor makes the tubes triangular in section to increase the heating surface; and he prefers to place them in rows, leaving uninterrupted channels between the rows.

MASON, W. *An improved rowlock for boats.* Dated June 13, 1856. (No. 1402.)

This rowlock is a frame which embraces the two sides and covers the top of the gunwale of the boat, and carries at top two rests forming a crutch for the oar. The frame is bolted through the gunwale.

CAPPELAIN, J. LE. *Improvements in machinery for bending sheet iron into corrugated forms for constructing beams.* (A communication.) Dated June 13, 1856. (No. 1403.)

On a main axis there are three adjustable wheels with rounded peripheries. The main axis is carried by parallel bars capable of being moved to or from each other. Above the three wheels are two similar wheels intermediate of the lower. The sheet iron is placed on supports attached to the two side bars, and as it is progressively bent the upper wheels come more and more between the lower.

BUNNETT, J. and J. G. *Improvements in the manufacture of sash-bars, columns, and mouldings for building and decorative purposes.* Dated June 14, 1856. (No. 1408.)

Sash-bars, columns, and mouldings are made of sheet iron, by drawing it between dies. Sheet iron sash-bars, columns, &c., (so made) are covered by the ordinary modes of japanning and polishing, or with glass or vitreous enamels, and on the same, or on metal sash-bars, &c., ornamental designs in imitation of woods, marbles, buhl, or inlaid work are produced.

MECHARD, J. E. *Improvements in printing or dyeing skeins, tissues, or other textile fabrics of cotton, wool, flax, and other fibrous substances.* (A communication.) Dated June 14, 1856. (No. 1409.)

Catechu and indigo are applied in the process of printing or dyeing, by which means good and fast colours are obtained and the indigo is economised.

AUBLET, E. A. *Improvements in rotary engines.* Dated June 14, 1856. (No. 1412.)

The rotary engine is a cylindrical casing closed over a piston consisting of a shaft upon which a drum is keyed, of a diameter less than the cylinder. This drum has a valve which forms a radial air-tight partition. At two points of the cylinder, and opposite to one another, two distributing apparatus are arranged; each consisting of an admission slide-valve and an emission one.

WRIGHT, W. *Improvements in the manufacture of articles of glass and plastic materials by means of pressure.* Dated June 14, 1856. (No. 1413.)

Bottles, &c., having necks narrower than their bodies, are made in two parts. The plunger or inner resisting piece is used to form both the body and neck of the vessel, and is withdrawn through an opening at the bottom. The bottom is moulded in a separate piece, which, while both are soft, is united to the body.

TURNER, W., G. HULME, and H. BLACKBURN, *Improvements in condensing and other carding engines, billies and mules for carding, slubbing, and spinning woollen, cotton, or other fibrous substances.* Dated June 16, 1856. (No. 1421.)

Claims — 1. In condensing and other carding engines, a cylindrical brush is fixed on an iron shaft, so disposed as to turn with the doffers and other top workers. The bristles of the brush enter the cards of the doffer, &c., and effect the clearing of the dirt or waste therefrom. 2. In slubbing and spinning wool, to prevent the breaking of the ends of the yarns, a worm wheel is adapted to the end of the shaft which imparts motion to the billy or mule, for preventing the surface drums from overrunning themselves or drawing back.

GEDGE, J. *Improvements in building materials.* (A communication.) Dated June 17, 1856. (No. 1422.)

Bricks of divers forms are to be made and to serve for any kind of moulding or archwork in buildings. Grooves are to be made on the top of each brick, so as to form, when fixed, rebates upon which will rest the tympans of vaults, which may thus be made of common bricks instead of wooden kerbs, vaultings, and laths, as now employed. Pine wood kerbs are used, and on these the bricks are set with plaster or mortar.

PROVISIONAL PROTECTIONS.

Dated November 19, 1856.

2735. Thomas Hindle, of Blackburn, Lancaster, manufacturer. Improvements in the manufacture of textile fabrics.

Dated November 21, 1856.

2756. Carl Heinrich Julius Wilhem Maximilian Liebmann, of Fartown, Huddersfield, York, warehouseman. Improvements in the purification of water, and in the preparation of materials employed therein. A communication.

Dated December 11, 1856.

2932. Joseph Chatwin, of Birmingham, gas-fitting and lamp-manufacturer. An expanding compensating slide for sustaining gas and other lights, also applicable for other similar purposes.

Dated December 19, 1856.

3011. John Murdoch, plumber and brassfounder, of Dundee. An improved ships'-main pump, applicable to other purposes also.

Dated December 20, 1856.

3012. Henry Moorhouse, of Denton, near Manchester, tailor. Improvements in self-acting signals for railways.

Dated January 9, 1857.

83. John Bagshaw and John Paine Harris, both of Belstead, Suffolk. Improved medicinal mixtures, adapted for curing diseases of cattle.

Dated January 10, 1857.

92. John Francis Porter, of Park-street, Westminster, civil engineer. Improvements in the manufacture of bricks and other articles of clay and brickearth, or of the like materials.

Dated January 24, 1857.

214. Patrick Henry Sharkey, of Liverpool, provision dealer. Improvements in the construction of scale-beams or balances.

216. James Harris, of Hanwell, Middlesex, engineer. An improved method of stopping or retarding railway carriages and trains, locomotive and stationary engines and machinery, together with certain apparatus which may be employed therein.

218. Charles James Wiggs, of Chester-street, Kennington, Surrey. An improved apparatus for feeding or supplying steam boilers with water.

220. Andrew McOnie, of Glasgow, engineer. Improvements in the construction of centrifugal machines, or "hydro-extractors," used for the manufacture of sugar and other purposes, and in the arrangement of appliances to give motion to such machines by steam power.

222. William Stubbs, of Liverpool, civil engi

neer, and James Burrows, of Wigan, civil engineer. Improvements applicable to water-closets.

Dated January 26, 1857.

224. John Fortescue, of Charles-street, Middlesex Hospital, London, baker. Improvements in the construction of the furnaces of bakers' ovens, for the purpose of consuming smoke, which improvements are also applicable to the consumption of smoke in other furnaces.

228. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. Improvements in the preparation of woollen hats, bonnets, and bodies for hats and bonnets. A communication from Messieurs de Clermont and Co.

230. William Henry Brown, of Portsea. Improvements in coffins.

232. Edward Highton, of Gloucester-road, Regent's-park. Improvements in electric telegraphs.

Dated January 27, 1857.

236. Thomas Watson, of Baxenden, near Accrington, Lancaster, overlooker, and Thomas Singleton, of Over Darwen, in the said county, weaver. Improvements in looms.

238. William Allen Turner, of Clarges-street, Piccadilly. Improvements in the manufacture of starch.

240. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Surrey. Improvements in coating iron or other metals with tin. A communication.

Dated January 28, 1857.

242. Colin Hunter, of Burnside, Antrim. Improvements in bleaching or cleansing textile fabrics or materials, and materials used for making paper.

244. Robert Harlow, of Stockport, brassfounder. Improvements in apparatus to be applied to steam boilers.

246. Joseph Harris, of Bolton, Lancaster, manufacturing chemist. Improvements in lighting gas for illumination.

248. Thomas Cooke, of New-street, Portland Town, Middlesex, gentleman. Improvements in ventilators for omnibuses, and in apparatus for actuating the same.

250. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. An improved protective matting or fabric for sheltering plants, shrubs, and other vegetable productions, pits, frames, and other similar structures, together with machinery for manufacturing the same, and the mode of supporting it when in use. A communication from J. Guyot.

252. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. An improved method of elevating water and other liquids. A communication from J. Ramar.

254. William Grant, of Newnham-street, Edgware-road. Improvements in the manufacture of hurdles and gates.

256. Arthur Clark, of Southampton. Improvements in signal-lamps.

258. George Edward Dering, of Lockleys, Herts. Improvements in lighting and warming trains of railway carriages.

Dated January 29, 1857.

260. Charles Edward Symonds, of Stones End, Southwark, paint and colour-manufacturer. Improvements in the manufacture of oxide of lead and its salts.

261. William Heywood, of Manchester, boiler maker. Improvements in boilers for generating steam.

262. Arthur Malins, of Birmingham, manufacturer. A new or improved method of ornamenting castors for furniture, lamps, chandeliers, cornices, and cornice-ends, curtain-bands, and curtain-pins.

263. George Sampson and Joseph Sampson, of Bradford, York, stuff-finishers, and Elijah Ledger, of Lofthouse, near Wakefield, York, book-keeper. Improvements in apparatus for effecting the folding or rigging of woven fabrics.

264. Samuel Jay and George Smith, of Regent-street. An improved hood or covering for the head, capable of being used either separate from, or in combination with, other garments, such as cloaks, mantles, capes, dressing-gowns, and other entire or partial coverings for the human body.

265. Charles de Bussy, of Mornington-road, London, mining engineer. The reduction of zinc ores.

266. James Roderick McDonald, of Hamburgh, merchant. Improvements in the manufacture of India-rubber over-shoes. A communication from N. Hayward.

267. William Weild, of Manchester, machinist. Improvements in looms for weaving pile fabrics, part of which improvements are applicable to looms for weaving other fabrics.

Dated January 30, 1857.

268. Pierre Ernest Lavaud de Lavigerie, of Rue de l'Echiquier, Paris. Certain improvements in the manufacture of comforters, scarfs, and other like coverings for the neck.

269. James Farrar, of Bury, Lancaster, agent. Improvements in apparatus for regulating the pressure and flow of gas.

270. John Talbot Pitman, of Gracechurch-street, London. An improvement for the letter organization of the instrumental music scale. A communication.

271. James Thom, of Lambeth, mechanical dentist. Improvements in the construction and mode of fixing artificial teeth.

272. Samuel Montagu, of Cornhill, London. Improvements in packing-cases.

273. James Russell Chibnall, of Westminster, baker. An improved method of burning or consuming smoke.

274. Charles Lenz, of Fenchurch-street, metallurgist. An improvement in the manufacture of cast steel.

275. Thomas Ellis, of Ty Mawr, Pontypridd, Glamorganshire, engineer. Certain improvements in the preparation of India-rubber and gutta percha by combining therewith other materials.

276. Alexander Wright, of Newcastle, Stafford, F.R.C.S. An improved manufacture of malt.

277. Frederick William Campin, of the Strand. The manufacture of a certain textile fabric termed by the inventor "tissu courroie." A communication from P. H. Moullin.

278. Isaac Holden, of St. Denis, near Paris. Improvements in washing and drying wool and other fibres, part of which improvements is applicable when connecting together lengths of leather for other purposes.

279. Isaac Holden, of St. Denis, near Paris. Improvements in combing wool and other fibres.

280. Isaac Holden, of St. Denis, near Paris. Improvements in preparing and combing wool and other fibres.

281. Isaac Holden, of St. Denis, near Paris. Improvements in carding wool and other fibres.

282. Henry Smith, of Birmingham, general die-sinker and embosser. Certain improvements in window price-tickets, and which said improvements are also applicable to the ornamenting and prizing the wrappers or paper boxes for holding fancy and other goods, also in the mode of attaching or suspending window-tickets.

283. Thomas Affleck, engineer, of Ceylon, at present residing in Manchester. Improvements in machinery or apparatus for pulping coffee.

284. James Owen, of Worsley, Lancaster, carpenter. Certain improvements in machinery or apparatus for the prevention of accidents in ascending and descending shafts of mines, which said

improvements are also applicable to hoisting and other lifting machines.

285. John Allin Williams, of Baydon, Wilts, farmer. Improvements in machinery or apparatus for ploughing or tilling land by steam power.

Dated January 31, 1857.

286. Adolph Hensel, of Stafford-place, Pimlico, Making compressed yeast.

287. Richard Appleby, of Newcastle-on-Tyne, millwright. Improvements in washing-machines.

289. William Hargreaves, of Bradford, York, machine wool-comber. Improvements in machinery for preparing and combing wool, hair, silk, cotton, flax, and other fibrous substances.

290. Henry Whittles and Robert Schofield, both of Rochdale. Improvements in the construction of the slide valves of steam engines, and in the mode of working the same, for the better regulation of the vacuum in the cylinders thereof, economizing fuel, and for ensuring safety and steadiness of such machines whilst in action.

291. William Edward Newton, of Chancery-lane, civil engineer. Improvements in the manufacture of buttons. A communication from J. F. Bapterosses, of Paris.

292. John Mayo Worrall, of Salford, Lancaster, dyer and finisher. An improvement in finishing certain descriptions of fustians called cords and thicksets.

293. Daniel Cooper and Thomas Wood Heaton, both of Manchester, ironmongers, and Thomas Lee Langshaw, of Salford, foreman. An improved apparatus applicable to the purposes of ventilation.

294. Daniel Howarth, of Manchester, size-dealer. The application of a substance, substances, or composition, not hitherto used for sizing or preparing woollen or worsted yarns or warps for weaving.

295. Astley Pastan Price, of Margate, Kent, chemist. Improvements in the separation of gold from certain auriferous mixtures, compounds, and products.

296. William Dray, of Swan-lane, London, agricultural-implement maker. An improvement in ploughs.

Dated February 2, 1857.

297. William Henry Holding and James Robert Casbay, both of Chatham, Kent, soap-makers. Improvements in the manufacture of soap.

298. Cotton Symonds, of Liverpool, merchant. Improvements in ships' night signals.

299. John Middleton, of Calais, France, lace-manufacturer. Improvements in consuming the smoke of furnaces.

300. Richard Robinson, of Salford, near Manchester, engineer. Improvements in machinery or apparatus for finishing yarns or threads.

301. Jean François Dudebout, of Rue de l'Echiquier, Paris. Certain improvements in looms for weaving.

302. Brook Hodgson and John Carter, of Halifax, York. Improvements in apparatus for introducing the pile wires used in weaving Brussels carpets and other piled fabrics.

304. Matthew Andrew Muir, of Glasgow, machinist, and James McIlwham, of the same place, machinist. Improvements in moulding or shaping metals.

305. Robert Morrison, of Newcastle-upon-Tyne, engineer. Improvements in steam boilers.

Dated February 3, 1857.

306. Thomas Cowburn, of Manchester, engineer; Jonathan Preston, of Pendleton, Lancaster, engineer; and Jeremiah Shetlock, of Salford, Lancaster, mechanic. Improvements in apparatus for regulating and indicating the pressure of steam and other fluids.

307. Thomas William Rayner, of Saint George's East, Middlesex, plumber and brass-founder. Improvements in cocks and valves.

308. James Hunt, of the Brades, Stafford. Certain improvements in shovels and spades for general use.

309. Florentin Garand, of Paris, mechanician. Improvements in transmitting motion and means of stopping it immediately.

310. William Lund, of Fleet-street, London, manufacturer. Improvements in securing cases containing bullion and other valuable property, parts of which are applicable to the securing of bales and other packages.

313. James Taylor, of Middlesbrough-on-Tees, Yorkshire. A compensating crane.

315. Charles Cochrane, of the Ormesby Ironworks, Middlesbrough-on-Tees. An improvement in heating blast for blast furnaces and cupolas.

317. Henry Unwin, of Sheffield, merchant. Improvements in the application of waste heat from coke-ovens.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," February 17th, 1857.)

2342. S. Bottomley, and J. W. Crossley. Improvements in the manufacture of pile or nap fabrics.

2344. W. Wilkinson. Improvements in casters, in the legs of tables, chairs, pianofortes, and other articles of furniture, and in apparatus for perforating caster wheels, which is also applicable to the perforating of glass articles generally.

2347. J. A. Le Franc. An improvement in lubricating oil cans or vessels. A communication.

2356. D. Foxwell. An improved mode or method of consuming smoke, and economising fuel thereby.

2369. J. B. Howell. Improvements in the manufacture of cast steel.

2375. C. R. N. Palmer. A signalising apparatus for carriages, and improved telegraph or signal apparatus applicable to other purposes.

2379. J. McInnes. An improved surface mineral coating for protecting iron and other substances, and an improved vehicle or varnish by which it is applied, and which varnish may be used with or without the addition of other substances.

2380. W. Rennie, jun. Improvements in the condensing apparatus of steam engines.

2383. W. H. Ashburn and J. Fairhurst. Improvements in machinery or apparatus used in the preparation of cotton or other fibrous substances for spinning.

2385. A. B. Seithen. Improvements in machinery or apparatus for cutting cork in the processes of shaping and making stoppers of cork, and in the treatment of cork to be employed in the said processes, and to be applied to other useful purposes.

2387. J. Latham. Registering the number of passengers by omnibuses and other vehicles and conveyances.

2398. J. Roscow. Certain improvements in machinery or apparatus for cutting or rasping dye woods.

2400. R. Sumner. Certain improvements in power looms for weaving.

2401. J. Knowles, jun. An improved apparatus for the prevention of accidents in winding from mines, which apparatus is also applicable for other similar purposes.

2409. J. Burrows. An improved arrangement of apparatus employed in winding coals or other minerals from mines, which said improvement is also applicable for other similar purposes.

2425. P. A. L. de Fontainemoreau. Certain im-

provements in the construction of turbines. A communication.

2426. P. A. L. de Fontainemoreau. An improved process for purifying brandies and other alcoholic products. A communication.

2429. W. Jeffrey. Improvements in machinery or apparatus for sawing or cutting wood.

2437. S. C. Lister and W. Tongue. Improvements in spinning.

2438. J. R. France. Improvements in electric telegraph apparatus.

2440. W. Palmer, jun. Improvements in roof candle lamps for railway and other carriages.

2442. R. H. Collyer. Improved method of manufacturing paper.

2445. J. George. An improved crane.

2456. J. Lacassagne and R. Thiers. An improved electric lamp.

2459. C. R. Freeman. Improvements in manufacturing food for animals.

2495. E. A. Athawes. An improvement in the construction of forks for forking land.

2526. A. E. Ragon. Improvements in apparatus for indicating and recording the speed of ships. —A communication.

2581. E. E. Scott. Improvements in stereoscopes.

2650. W. Clark. Improvements in the manufacture of barytes and strontian and their salts, and in their application to various purposes. A communication.

2752. R. Eaton. Improvements in apparatus for buffing on railways and for other purposes.

2764. S. Russell. Improvements in the construction of scissors and shears.

2831. J. L. Clark. Improvements in electric telegraphs. Partly a communication.

2939. R. Emery. Improvements in the construction of certain kinds of agricultural implements (for breaking clogs of earth and levelling the soil), called harrows.

3021. R. Gibson. An improved self-acting apparatus for signalling on railways.

3074. W. Clark. Improvements in air and waterproof coatings, and in their applications. A communication.

71. T. Ball and J. Wilkins. Improvements in manufacturing looped fabrics, suitable for the making of gloves and other articles.

92. J. F. Porter. Improvements in the manufacture of bricks and other articles of clay and brickearth, or of the like materials.

114. Sir J. Murray, Knt. Abating the smells and increasing the fertilising usefulness of liquid manures, sewage, gas, or other liquors, and for means of raising or propelling such mixtures, and other solids or fluids, to convenient heights or distances.

157. E. Clark. Improvements in floating docks.

159. E. Clark. Improvements in machinery or apparatus for raising ships out of the water for the purposes of examination and repair.

193. J. Rubery. Improvements in runners, top notches, and other parts of umbrellas and parasols.

194. G. P. di Termini. Improvements in the construction of artificial hands.

220. A. McOnie. Improvements in the construction of centrifugal machines, or "hydro-extractors," used for the manufacture of sugar and other purposes, and in the arrangement of appliances to give motion to such machines by steam power.

224. J. Fortescue. Improvements in the construction of the furnaces of bakers' ovens for the purpose of consuming smoke, which improvements are also applicable to the consumption of smoke in other furnaces.

232. E. Highton. Improvements in electric telegraphs.

240. G. T. Bousfield. Improvements in coating iron and other metals with tin. A communication.

248. T. Cooke. Improvements in ventilators for omnibuses, and in apparatus for actuating the same.

249. W. H. Sisterson. An improvement in cranes.

256. A. Clark. Improvements in signal lamps.

266. J. R. McDonald. Improvements in the manufacture of India-rubber over-shoes. A communication.

276. A. Wright. An improved manufacture of malt.

278. I. Holden. Improvements in washing and drying wool and other fibres, part of which improvements is applicable when connecting together lengths of leather for other purposes.

279 I. Holden. Improvements in combing wool and other fibres.

280. I. Holden. Improvements in preparing and combing wool and other fibres.

281. I. Holden. Improvements in carding wool and other fibres.

284. J. Owen. Certain improvements in machinery or apparatus for the prevention of accidents in ascending and descending shafts of mines, which said improvements are also applicable to hoisting and other lifting machines.

289. W. Hargreaves. Improvements in machinery for preparing and combing wool, hair, silk, cotton, flax, and other fibrous substances.

292. J. M. Worrall. An improvement in finishing certain descriptions of fustians, called cords and thicksets.

295. A. P. Price. Improvements in the separation of gold from certain auriferous mixtures, compounds, and products.

304. M. A. Muir and J. McIlwham. Improvements in moulding or shaping metals.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1854.

351. John Burt Smith and Edward Smith.
361. Patrick O'Connor.
368. John Wren.
375. John Davie Morries Stirling.
378. Thomas Fawcett, jun.
388. Moses Poole.
393. Edward Loysel.
424. William Edward Newton.
428. Edward Massey.
429. Samuel Colt.
452. Edward Hammond Bentall.
455. Auguste Edouard Loradoux Bellford.

LIST OF SEALED PATENTS.

Sealed February 13, 1857.

1905. Peter Augustin Godefroy.
1908. Henry Columbus Hurry.
1914. William Hargreaves.

1916. David Chalmers.
1919. Samuel Lilley.
2009. Jean Baptiste Feauveau and Louis Alexander Legrand.
2013. John Brown.
2020. Charles Goodyear.
2049. James Picken.
2145. John Henry Johnson.
2157. George Cranstoun Trotter Cranstoun, George Young, and John Lovell.
2191. Thomas Greenwood.
2230. Alfred Vincent Newton.
2231. William Johnson.
2386. George Heppell.
2656. John Henry Johnson.
2959. William Beevers Birkby.
2969. Archibald Turner.
2989. William Edward Newton.

Sealed February 17, 1857.

1933. Henry Forfar Osman.
1951. Joseph Hacking and William Wheeler.
2062. Benjamin O'Neale Stratford, Earl of Aldborough.
2063. Richard Archibald Brooman.
2089. John Fowler, jun.
2317. William Johnson.
2645. James Somerville.
2759. Frédéric Ludewig.
2841. Edward Jackson Emmons.
2878. Ebenezer Daggett Draper and George Draper.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

The publication of several letters and articles is unavoidably deferred.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine*, must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

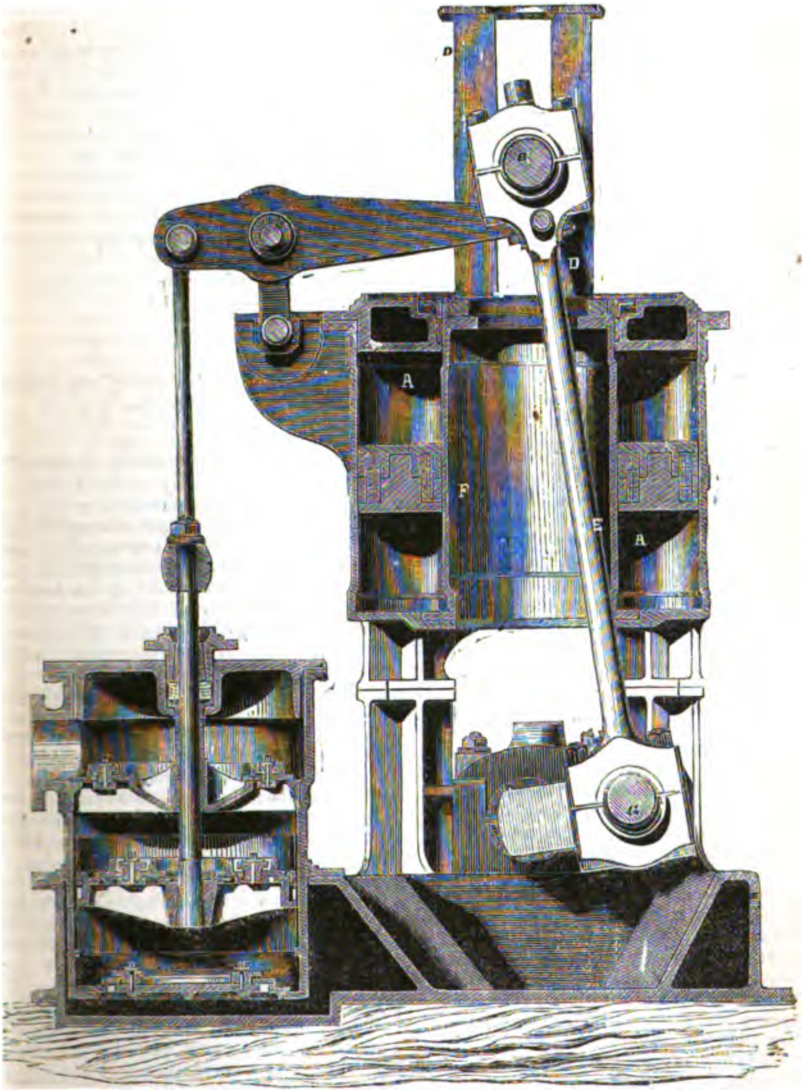
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1751.] SATURDAY, FEBRUARY 28, 1857. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

MAUDSLAY'S IMPROVED ENGINES FOR SCREW PROPULSION.



MAUDSLAY'S IMPROVED ENGINES FOR SCREW PROPULSION.

Mr. Joseph Maudslay has patented a firm and compact arrangement of marine steam engine, intended for the purpose of screw propulsion. An annular cylinder is placed immediately above the crank-shaft, and the power from the piston-rod cross-head is communicated above the cylinder to the crank by means of a connecting-rod passing downwards through the central or inner cylinder.

The engraving on the preceding page is a side view in section of a pair of coupled engines, showing these improvements as intended for screw propulsion. A front elevation of them will be given in our next. A is the annular cylinder; B piston-rod cross-head, to which the two piston-rods, C C, are connected; D D the guide for the cross-head; E the connecting-rod working through the inner cylinder, F, and communicating the power from the piston-rod cross-head to the crank, G.

This arrangement of engine is proposed to be used more especially in commercial steam vessels, where it is not necessary to keep the machinery entirely below the water line; and its advantages consist, firstly, in having the cylinder placed upright directly over the crank-shaft, and supported on short standards cast on the condenser or bed-plate, thus forming a very rigid and firm combination in itself, and not requiring any connection from the vessel to steady it; secondly, in having the piston-rod, glands, and cross-head guides on the top of the cylinder cover, where they are more easily attended to than when placed horizontally or below the cylinder; and also in having all the joints and moving parts of the engine arranged so that they can be conveniently got at for the purpose of oiling, which is of great importance in engines working at a great velocity, in order that they may be kept in good condition; and thirdly, in this arrangement a much longer connecting rod is obtained than in ordinary engines, in consequence of which the side thrust on the cross-head guides is considerably reduced.

LONDON FIRES IN 1856.

Twenty-sixth Annual Report. By Mr. William Baddeley, C.E., Inventor of the Portable Canvas Cisterns, Improved Jet-spreaders, Farmer's Fire-engine, &c., &c.

(*Concluded from page 175.*)

The causes of fire, it will be seen, have been much of the usual character, although there is upon this occasion some little diversity from the ordinary proportions. The number of fires known or suspected to have been wilfully occasioned, is lamentably large.

In one instance a police constable is said to be suspected of having set fire to a stable used as a depository for empty packing cases, straw, &c., for the sake of the "discovery money." He immediately gave an alarm of "fire," and a fire-escape conductor who was promptly in attendance would have extinguished the fire with a bucket of water, but was prevented by the police, lest they should lose their gratuity for "*keeping the fire.*" The constable received a sovereign from the Brigade authorities for his *praiseworthy conduct?*

The practice of incendiarism, by insolvent shop-keepers, still increases, and will continue to increase so long as these vile frauds are knowingly and tacitly submitted to. It is very natural that insurance companies should wish to avoid "the trouble and bad odour" of being prosecutors, as they "never appear to less advantage than when contesting claims on policies in courts of law." Still, in flagrant cases, a decided stand should be made, and public sympathy should go with them.

Although the older offices are occasionally victimised, the younger offices are more frequently the judiciously selected victims. Two incendiary fires occurred recently in Islington, both in tailors' shops; the one *sufferer* received the full amount of his loss; the other so liberal a settlement as to realise a very handsome profit by the transaction. The number of fires is so greatly beyond the risk with this particular class of tradesmen, as to be altogether unintelligible, without attributing them to incendiarism.

The following appeared in the *Islington Gazette* of November 29th last:

"Suspected Incendiarism.—At about half-past three o'clock on Monday morning a fire broke out in the shop of Mr. Smith, tailor, at the corner of Prebend-street, Arlington-square. On discovering the fire, the police constable gave an alarm and sent for the needful assistance. In a brief space of time the fire-escape from Islington-green arrived, attended by Conductor Newell, and Mr. Inspector Baddeley, who, finding the inmates were all out, and the fire raging in the shop, commenced pouring water into the first-floor windows, so as to prevent the ascent of the flames. Mr. Brown arrived shortly after with the Islington engine, which was set to work and the fire extinguished. As soon as the heat and smoke was sufficiently abated to permit the shop to be entered, the appearances led to a suspicion that the fire had been wilfully occa-

sioned. A chest of mahogany drawers was laying in the centre of the shop, front downwards, and on raising them up, one of the drawers was found to be absent, and its place occupied by shavings, paper, and firewood. On opening the drawers they were found to contain paper parcels filled with shavings, walnut shells, &c. In the lowest drawer there was some firewood, and a parcel of shavings which had been placed there in a burning state, but had been extinguished by want of air. In the immediate vicinity of the gas-meter, on the Coleman-street side of the shop (which the fire did not reach) were some empty bandboxes; and a large quantity of shavings in paper, and rags, and firewood, were found in various parts of the shop and on the shelves. The fan-light over the shop-door had been recently blocked up, so that no fire could be seen from the street. The stock-in-trade and furniture was insured for 600*l.*, and the policy was found buried in a tin box in the cellar. A searching investigation was made to ascertain the cause of the fire, which was said to have been occasioned by an escape of gas; but it was found that the gas was turned off at the main-pipe when the fire took place, so that no escape of gas existed."

While one class of offices by their excessive timidity thus give encouragement to fraud, another class flies to the opposite extreme and treats all sufferers as knaves. A writer in the *Daily Telegraph* commenting upon a trial which had recently taken place, observes, "Besides actions at law there are such things as compromises, and it is tolerably well known that part of the tactics of a certain class of offices is to drive a hard bargain with those who have claims upon them. The spirit of compromise is a predominating feature in the management of not a few fire-offices. Strange things are told of one of our oldest and most influential offices, as to the conduct of its managers towards its insurers in their hour of misfortune; and when it is known that large claims are often cut down to very moderate payments under the system referred to, the necessity for caution in the selection of offices in which to insure, cannot be too strongly inculcated."

Although a large portion of the existing fire-offices may be divided into one or other of these classes, yet happily there are many, both of the old as well as the younger offices, where honourable and equitable dealing is the rule of the establishment.

It is an important statistical fact, that whereas, of property generally only *one-half* is protected by insurance; of property burned, *two-thirds* are found to be insured. This increase of danger to property after insurance, is attributed partly to the absence of due precaution, but principally to motives of fraud.

In August last a singular case of spontaneous combustion occurred at Bedford. In fumigating the house of Mr. Moreton, the sulphur overflowed into a bassinette, burned through the bottom, set fire to the floor, and ate its way through the planks. Timely discovery led to the extinction of the fire, and all was supposed to be safe. But as the head of the house was retiring to rest he threw his stockings on the floor, and to his great astonishment saw them take fire. On the following day, no less than thirty different outbreaks of fire took place in the house. The circumstances were deemed so extraordinary, that the Coroner held a court of inquiry to investigate the cause of these fires. The succession of fires breaking out suddenly in various parts of the house without any apparent cause was fully proved. A chemist and druggist deposed to his belief in spontaneous combustion. Dr. Barker gave an opinion that, "there was *something* pervading that house, which produced spontaneous combustion." Mr. Blower, a surgeon, went a little further, saying "there was *something* in the *atmosphere* which caused the spontaneous combustion." The jury ultimately returned a verdict, "that the fire was accidentally caused by incautiously placing and setting fire to a quantity of brimstone in a pot, the same being placed in a bassinette; but as to the cause of the continuation of fires in the said premises, we have not sufficient evidence to show." Dr. Barker afterwards addressed a letter to the *Times*, explanatory of his views after further investigating this singular affair. "The first fire," says Dr. Barker, "was clearly the result of burning sulphur with phosphoric matches. But afterwards other fires broke out, and were witnessed by myself and many other observers. I have come to the conclusion that the cause of these fires must be found in a compound formed by the combustion of phosphorus and sulphur; that this compound, in vapour, pervaded the house, especially the linen and textile fabrics, and 'spontaneously' (*i. e.*, without contact of flame) ignited at various intervals. During my experiments on this question I have become acquainted with a compound by which any textile fabric may be so affected as to ignite spontaneously when exposed to the air; and I have been struck by the resemblance of this combustion and its accompanying odour to the phenomena observed at the house in Horne-lane." Unfortunately for the Doctor's ingenious theory, there results from the combustion of sulphur with phosphorus *no vapour* having any such property as is here attempted to

be ascribed to it. Small particles of phosphorus, dropped about the house, would readily account for all the phenomena (odour inclusive) which has in this instance given "philosophers such trouble." It will be observed, that no less than nineteen of last year's fires in the Metropolis have been clearly traced to the agency of that mysterious and mischievous property of matter —spontaneous combustion.

The following tabular analysis exhibits, in each instance, the occupancy of that part of the premises in which the fire originated, illustrating the comparative liability to accident by fire of various trades, manufactories, and private dwellings:

Occupation.	Totally Destroyed.	Seriously Damaged.	Slightly Damaged.	Total.
Apothecaries, not having laboratories	—	3	2	5
Bacon-dryers	—	1	—	1
Bakers	—	4	11	15
Barge and boat-builders ...	—	—	1	1
Baths	—	1	1	2
Beershops	—	9	5	14
Blacking-makers	—	1	1	2
Booksellers, binders, and stationers	—	5	13	18
Brewers	—	—	1	1
Brokers and dealers in old clothes	—	8	6	14
Builders	1	5	1	7
Butchers	—	2	2	4
Cabinet-makers	2	15	10	27
Caoutchouc-manufacturers ...	—	1	—	1
Carpenters and other workers in wood...	5	20	21	46
Chandlers...	1	12	14	27
Cheesemongers	—	1	4	5
Chemists, manufacturing ...	—	1	1	2
Churches	—	1	4	5
Cigar-manufacturer	—	—	1	1
Coachmakers	—	2	—	2
Coal merchants	—	1	1	2
Cocoa-nut fibre manufacturers	—	—	1	1
Coffee-shops and chop houses..	—	3	13	16
Colour-manufacturers	—	3	3	6
Confectioners and pastrycooks	—	—	5	5
Coopers	—	2	3	5
Cork-burners	—	1	—	1
Cornchandlers	—	6	—	6
Cotton-wool, workers in ...	—	1	—	1
Docks	—	—	2	2
Drapers, linen, woollen, and mercers...	—	8	18	26
Druggists, wholesale	—	1	2	3
Drysalters	—	1	—	1
Dyers	—	—	1	1
Eating-houses	—	3	5	8
Emery-paper and black-lead manufacturers	—	2	—	2
Engineers, mechanical ...	—	3	3	6
Fancy box-makers	—	2	1	3
Farming stock	—	6	—	6
Feather-merchants, & dressers.	—	1	1	2
Firewood-manufacturers (patent)	—	—	2	2
Firework-makers	—	1	1	2
Flour-mills, steam	1	—	1	2
Founders	—	—	3	3
Furriers and skin-dressers ...	—	3	1	4
Gas-works	—	—	1	1
Glassblowers	—	—	1	1
Granary-keeper	—	1	—	1
Grocers and tea-dealers ...	1	10	7	18
Hat-makers	1	6	4	11
Hop-merchants	—	1	—	1
Horsehair-merchants	—	2	—	2
Hospitals	—	—	2	2
Hotels and Club-houses ...	—	—	5	5
Ice-merchants	—	1	—	1
Japanners...	—	1	—	1
Laundresses	—	3	5	8
Leather-manufacturer, patent.	1	—	2	3
Lucifer-match makers	—	3	2	5
Marine stores, dealers in ...	—	4	1	5
Mattress-makers	1	1	—	2
Musical-instrument makers ...	—	3	1	4
Milliners and dressmakers ...	—	3	9	12
Oil-works...	—	1	—	1
Oil and colourmen	3	9	11	23
Painted-baize manufacturers...	—	2	—	2
Perfumers, manufacturing ...	—	1	2	3
Plumbers, painters, & glaziers.	—	2	1	3
Printers, letter-press	—	3	2	5
,, copper-plate	—	1	—	1
Private dwellings	3	41	219	263
Rag-merchants	1	2	—	3
Railways	1	1	—	2
Rope-makers	—	1	2	3
Sail-makers.	1	1	—	2
Sale-shops and offices	—	19	26	45
Saltpetre refiners	—	1	—	1
Saw-mills, steam	1	6	4	11
Scaleboard-cutters	—	2	—	2
Schools	—	—	3	3
Ships	—	1	2	3
,, steam	—	1	—	1
Ship-builders	1	3	1	5
,, chandlers	—	1	—	1
Stables	—	6	5	11
Soot-merchant	—	—	1	1
Tailors	1	15	6	22
Tallow-melters, tallow-chandlers, and soap-boilers ...	—	6	2	8
Tanners	—	—	1	1
Tar-distillers	1	2	—	3
Theatres	2	—	2	4
Timber-merchants	—	1	1	2
Tinmen, braziers, and smiths..	—	2	9	11
Tobacconists	—	—	5	5
Under repair, or building ...	2	2	9	13
Unoccupied	1	2	2	5
Upholsterers	—	—	4	4
Victuallers, licensed	1	21	28	50
Warehouses	—	1	1	2
,, French fancy ...	—	3	2	5
,, Manchester ...	—	2	3	5
Waterproof-canvas makers ...	—	8	1	9
Weavers	—	1	1	2
,, mat	—	1	—	1
Wharfingers	—	—	1	1
Wine and spirit merchants ...	1	5	—	6
Wool-staplers	—	2	1	3
Zinc-mill	—	1	—	1
Total	34	359	564	957

A valuable and highly interesting paper, by Mr. Braidwood, on "Fires, the best means of preventing and arresting them; with a few words on fire-proof structures," was read before the Society of Arts in May last, and was followed by a lengthened discussion,* in the course of which it was shown that the arrangements for saving lives and extinguishing fires in London were peculiar; that the legal provisions for this purpose had become totally obsolete, and had been superseded by two *voluntary associations* unrecognised by any legal enactment whatever.† Complaints were made that the present arrangements for extinguishing fires in London were inferior to those of other towns where direct water pressure was employed. The unprotected state of all the populous suburban districts was pointed out, and also the illiberality of the parochial authorities generally in reference to fire extinction.

Mr. Chadwick, in concluding a very interesting and pertinent review of the subject, observed that, "the present state of things,—the combined prevalence of defective legislative and administrative as well as of engineering arrangements, in the face of proved available means of protection—the weakening of the unconscious action of natural interests in precaution by unguarded full insurance, in contravention of the established principles of insurance—the temptation to the commission of crime by the absence of proper means for its detection and prosecution—the daily occurrence of fires in the metropolis, the number of horrible deaths from them, as well as the loss of property which they occasioned—the apparent apathy with which such calamities were regarded, and the rapidity with which they were forgotten,—were all deeply to be lamented, and would hereafter be referred to as evidence of a very low social condition, and of defective administrative capacity and organisation."

In moving a vote of thanks to Mr. Braidwood for his valuable paper, the chairman, John Thwaites, Esq., said, "That paper had led to a discussion upon many very important points, and he trusted that the result might be an improvement in the means of annihilating fires. It could not, he apprehended, be doubted but that a strong impression must have seized the mind of every practical man present, as to whether the organization of the Fire Brigade was either satisfactory to the public or safe to the community at large. No doubt the insurance societies, who bore exclusively the cost of this establishment, had a direct interest in sustaining it in the most efficient manner. The very fact of keeping up an establishment at so serious a cost to the companies themselves, must be sufficient proof that they had a commercial interest in extinguishing fires as speedily as possible. But how far the present system was one that ought to remain satisfactory to the Metropolitan public, was a question in his mind anything but settled. It was not for him, especially in the peculiar position which he had the honour to hold,* to indicate that kind of organization which should supersede, or act as an auxiliary to that which was already in operation. He could not but feel that the Metropolitan public, who were so largely taxed by government upon an act of the first prudence, viz., the insurance of their property, had a right to ask from the government some protection to their lives and property in return. And at the same time, he could not admit that the insurance companies had no interest, or should not be called upon to contribute towards an establishment that would so protect the lives and property of the Metropolitan public. How that arrangement was to be made, and what should be the future management, was a question which he could not venture to indicate, but that some more extensive organization should be established, must be apparent to all who had listened to the discussion."

At the close of the discussion, J. E. B. Curtis, Esq., Secretary to the Fire Annihilator Company, challenged Mr. Braidwood "to justify his neglect of the *fire-annihilator* as an auxiliary power, in the face of the facts of successful use by the Leed's Fire Brigade, and others."

In June last, a series of very severe trials to test the powers of the *fire-annihilator* took place at the Aldershott Camp, by order of the Minister of War. These experiments proved eminently successful; in each trial an immense body of flame was rapidly brought down by the *fire-annihilators*, and the remaining embers extinguished with a few buckets of water and a hand-pump. A week before the experiments came off, an actual fire broke out in the camp, which was successfully arrested by means of the *fire-annihilators*.

Superintendent White continues to use the fire-annihilators at Gravesend, with much advantage. Within one week in December last, no less than three fires, which

* *Vide Journal of the Society of Arts* for May 9th and 23rd.

† The question was raised a short time since, by the City Police, of "who are firemen?" It was found on reference to the only existing enactment—the 14th Geo. III., cap. 78—that in addition to the parish engine-keepers, the only *legal firemen* in the metropolis were those belonging to the *West of England Fire-office*.

* Chairman of the Metropolitan Board of Works.

threatened to be of a most disastrous character, occurred in Gravesend. One of these fires was extinguished, and the progress of another effectually checked by the fire-annihilators. Perhaps there is no other town in the kingdom where such a marked improvement has been effected in the fire-extinguishing department as in Gravesend. This improvement is entirely due to the skilful and unwearied exertions of Mr. Superintendent White. The old fire-engines have been thoroughly repaired, and as far as possible modernised; they have been well supplied with hose, escape-ladders, and other necessaries. The water supply, although still far from perfect, has been greatly ameliorated, and fire-annihilators have been adopted as an auxiliary power in aid of the fire-engines. The police constables are well trained in the management of the whole; and they have already afforded many convincing proofs of their efficiency. When the smallness of the means available for these purposes in Gravesend is considered, the result is highly creditable to the authorities.

At Hartlepool Mr. R. Merryweather, agent to the West of England Insurance Company, having been furnished with an excellent first-class fire-engine by that spirited company, has organised a *voluntary Fire Brigade*, which on several late occasions have highly distinguished themselves. The *Durham Chronicle* of October last, describing a serious conflagration at Stockton, observes: "About eight o'clock the Hartlepool Fire Brigade, which had been sent for when there was imminent risk of the fire spreading, arrived under the command of their captain, Mr. Richard Merryweather, and presented such a compact and imposing array, that if the fire had not been got under at the time of their arrival, they would, we are certain, have rendered very efficient services. As a proof of the excellence of their discipline it may be stated, that they arrived in Stockton one hour and a quarter after receiving the summons, that short time having sufficed to get the men together, get out the engines, put them on the rail, and travel to Stockton." A striking contrast occurs in another column of the same paper; describing another fire at Bishop Auckland, it adds: "The bishop's fire-engine was sent for, *being the only one in this large and populous district.*"

The gross mismanagement of the parish engine of the large and populous district of St. Pancras continues to give great and general dissatisfaction to the inhabitants, one of whom addressed a letter to a morning paper in July last, complaining that a fire having broken out the day before, and the engine applied for, it was sent out from the workhouse in charge of four paupers, three of them idiotic, the other a dwarf and cripple, who slowly drew the engine to the fire, but were quite unable to set it to work; the consequence was that the house was gutted long before any other engines could reach the fire." The writer adds: "The sending out of such an incompetent gang is not only absurd, but a disgrace to the authorities, as well as an act of injustice and cruelty to the poor unfortunates dispatched on such an errand." In consequence of the illiberality of the parochial authorities in the matter of *fire rewards*, no engine-keeper from the surrounding parishes will knowingly run into St. Pancras, which has of late been the locality of many serious conflagrations.

Among the most serious fires of the year may be noted the following, at each of which a serious destruction of property took place, and the suppression of which called for the most skilful and indefatigable exertions of the firemen.

Saturday, January 12th. The extensive pianoforte manufactory of Messrs. Hopkinsons in Diana-place, New-road, St. Marylebone.

Wednesday, February 13th. The Pavilion Theatre, Whitechapel-road.

Thursday, February 28th. The extensive premises of Messrs. Alcock, Hilton and Co., oil merchants, &c., Three Craneslane, Upper Thames-street.

Wednesday, March 5th. The Theatre Royal, Covent-garden.

Wednesday, March 12th. The steam saw mills and joiners' workshops of Messrs. Scott, Russell, and Co., Millwall, Poplar.

Wednesday, March 26th. The pianoforte manufactory of Messrs. Harrison and Co., in John-street, Tottenham-court-road.

Tuesday, April 1st. The extensive premises of Messrs. Dobbs, Kidd, and Co., wholesale and manufacturing stationers, in Fleet-street.

Tuesday, April 15th. The premises of Mr. Clark, wax and tallow-chandler, in Albany-street, Regent's-park.

Sunday, April 27th. The premises of Messrs. Hanneford Brothers and seven adjoining buildings, in High-street, Edmonton.

Saturday, June 7th. Messrs. Norton's patent wool manufactory, Holland-street, Blackfriars-road.

Saturday, June 28th. The premises of Mr. Lacey, printers' joiner, and adjoining buildings, in Little Bartholomew-close.

Friday, July 18th. The steam flour mill of Messrs. Pemm and Co., and the oil stores of Mr. Jones, at Shad Thames.

Tuesday, August 12th. The extensive pianoforte manufactory of Messrs. Broadwood and Sons, Horseferry-road, Westminster.

Monday, August 25th. The premises of Mr. Gilbert, sail-cloth manufacturer, &c., in Narrow-street, Limehouse.

Sunday, September 7th. The granary of Messrs. Green and Sedgwick, Rutland-wharf, Upper Thames-street.

Friday, September 19th. The brush manufactory of Messrs. Matthews, and Co., and adjoining buildings, in Upper Thames-street.

Sunday, November 9th. The premises of Messrs. Almond and Co., army accoutrement makers, and adjoining buildings, in Swan-yard, St. Martin's-lane, Charing-cross.

At several of these, and other serious fires, the steam floating fire-engines were brought to bear with great success: wherever their services can be made available they are invaluable. Notwithstanding the distance of Messrs. Broadwood's premises from the water side, and the enormous quantity of hose required to reach them, the steam floating engine rendered most essential service. The Southwark-bridge floating engine has attended eighteen, and worked at eight fires during the year. The Rotherhithe floating engine has also worked at eight fires during the same time.

The London Fire Establishment continues to have the benefit of Mr. Braidwood's valuable superintendence, and he is ably supported by the district foremen, Messrs. Fogo, Colf, Staples, and Henderson.

The West of England firemen, under the veteran Connorton, still bear their blushing honours thick upon them.

13, Angell-terrace, Islington,
February 5, 1857.

MR. MALLET'S WORK ON "THE CONSTRUCTION OF ARTILLERY."

The following is the postscript by Dr. Hart, which was received too late for insertion in our last number:

On referring to my original equations, I find that I was wrong in assuming that in the case of external pressure t would diminish from the outer to the inner surface, and that in fact in this case also $n+t$ is constant for a *simple* cylinder, from which it follows that the effect of cubical compression is merely to substitute

$$e\frac{e+3\,E}{e+2\,E}$$

for k in the result, without altering the form of my equations; and that if the equations of the *Civil Engineer* are true, mine are not only approximately but accurately correct (k being duly determined); but it is clear that neither this nor any other empirical theory of elasticity affects the other example of three concentric cylinders, nor the principle of Mr. Mallet's built-up gun. In fact it is quite evident that whether $n+t$ is constant or variable *for each particular cylinder*, it will be different for the different cylinders of which the built-up gun consists, and that its amount for each of these cylinders will depend on the tension with which it was originally fastened on, and may therefore be varied arbitrarily according to any required law in the complex cylinder, as I have already proved in my letter to Mr. Mallet.

A. S. Hart.

[We regret that Dr. Hart's postscript did not reach us until our remarks on his letter had gone to the press. The equations which we gave in our last Number have suggested to us a different method of investigating the possibility of obtaining at four several points (when there are four rings) an extension corresponding to that of greatest tensile force, which is, to our mind, more satisfactory than that given by Dr. Hart; and while it corroborates his views, removes those difficulties which had previously led us to give so much weight to the objections of the Reviewer in the *Civil Engineer*, as to be unable to subscribe to Dr. Hart's views. We have reversed his method, and assuming only that the normal pressure at the inner and outer surfaces of the rings respectively in contact is the same for both, we have obtained equations for each ring, and then adding to the tangential tensile forces for each ring that due to the explosion, we have represented the conditions that the whole tensile force is that of rupture, and made the corresponding calculations. The result is, as we have said, corroborative of Dr. Hart's view of the case.

Let the radii taken in order from the inside to the outside be r, r_1, r_2, r_3 and R. It is evident that, before explosion takes place, the effect on the outer cylinder of shrinking on is to produce some normal pressure on the cylinder next it; and as the normal force on its exterior surface is zero, it must be treated as a cylinder having this normal pressure applied at its inner surface. Also, since there is no internal pressure on the innermost cylinder, we must consider it as acted on by an external pressure on its outer surface. The two central cylinders must be considered as acted on by an external and internal pressure, subject only to the condition that the pressure on the external surface of one cylinder must be equal to the pressure on the internal surface of that in contact with it. Let then P_1, P_2, P_3, be the

supposed pressures between the 1st and 2nd, 2nd and 3rd, 3rd and 4th cylinders respectively; let n_1 and t_1 be the normal and tangential tensile forces for the innermost cylinder; n_2, t_2 those for the next, and so on. We have these pairs of equations for the successive cylinders.

$$\left.\begin{aligned} n_1 &= P_1 \frac{x^2-r^2}{r_1^2-r^2}\,\frac{r_1^2}{x^2} \\ t_1 &= -P_1 \frac{x^2+r^2}{r_1^2-r^2}\,\frac{r_1^2}{x^2} \end{aligned}\right\}\ldots\ldots\ldots\ldots\ldots\ldots(A)$$

$$\left.\begin{aligned} n_2 &= P_1 \frac{r_2^2-x^2}{r_2^2-r_1^2}\,\frac{r_1^2}{x^2} + P_2 \frac{x^2-r_1^2}{r_2^2-r_1^2}\,\frac{r_2^2}{x^2} \\ t_2 &= P_1 \frac{r_2^2+x^2}{r_2^2-r_1^2}\,\frac{r_1^2}{x^2} - P_2 \frac{x^2+r_1^2}{r_2^2-r_1^2}\,\frac{r_2^2}{x^2} \end{aligned}\right\}\ldots(B)$$

$$\left.\begin{aligned} n_3 &= P_2 \frac{r_3^2-x^2}{r_3^2-r_2^2}\,\frac{r_2^2}{x^2} + P_3 \frac{x^2-r_2^2}{r_3^2-r_2^2}\,\frac{r_3^2}{x^2} \\ t_3 &= P_2 \frac{r_3^2+x^2}{r_3^2-r_2^2}\,\frac{r_2^2}{x^2} - P_3 \frac{x^2+r_2^2}{r_3^2-r_2^2}\,\frac{r_3^2}{x^2} \end{aligned}\right\}\ldots(C)$$

$$\left.\begin{aligned} n_4 &= P_3 \frac{R^2-x^2}{R^2-r_3^2}\,\frac{r_3^2}{x^2} \\ t_4 &= P_3 \frac{R^2+x^2}{R^2-r_3^2}\,\frac{r_3^2}{x^2} \end{aligned}\right\}\ldots\ldots\ldots\ldots\ldots\ldots(D)$$

Let now the internal pressure P be applied by the explosion; then throughout the gun we may take the equations

$$\left.\begin{aligned} n &= P \frac{R^2-x^2}{R^2-r^2}\,\frac{r^2}{x^2} \\ t &= P \frac{R^2+x^2}{R^2-r^2}\,\frac{r^2}{x^2} \end{aligned}\right\}\ldots\ldots(E)$$

This value of t must be added to t_1, t_2, t_3, and t_4, respectively, to obtain the tensions after the explosion in the inner and the successive cylinders. It is also evident that for the outer cylinder the *greatest* value of this compound tension will be at the inner surface, or where $x=r_3$; assuming then that this tension and those at the inner surfaces of all the other cylinders are equal to the tension of rupture T, we have the four equations

$$P\frac{R^2+r^2}{R^2-r^2} - P_1 . \frac{2r_1^2}{r_1^2-r^2} = T \ldots\ldots\ldots\ldots\ldots (1.)$$

$$P\frac{R^2+r_1^2}{R^2-r^2}\,\frac{r^2}{r_1^2} + P_1\frac{r_2^2+r_1^2}{r_2^2-r_1^2} - P_2\frac{2r_2^2}{r_2^2-r_1^2} = T \ldots\ldots (2.)$$

$$P.\frac{R^2+r_2^2}{R^2-r^2}\,\frac{r^2}{r_2^2} + P_2\frac{r_3^2+r_2^2}{r_3^2-r_2^2} - P_3\frac{2r_3^2}{r_3^2-r_2^2} = T \ldots (3.)$$

$$P.\frac{R^2+r_3^2}{R^2-r^2}\,\frac{r^2}{r_3^2} + P_3\frac{R^2+r_3^2}{R^2-r_3^2} = T \ldots\ldots\ldots\ldots (4.)$$

We have here four equations and four quantities to be determined, viz., P, P_1, P_2, P_3.

On this view of the case, which is suggested by the equations we derived for a series of cylinders in last week's number, we cannot see at present that there is any inconsistency in supposing that the effect of shrinking on successive rings may be somewhat analogous to that which Dr. Hart assumes.

The determination of these values of the pressures will satisfactorily dispose of the question.

Let $R=3r$, $r_3=\frac{5r}{2}$, $r_2=2r$, $r_1=\frac{3r}{2}$.

These equations become

$$\frac{5}{4}P - \frac{18}{5}P_1 = T \ldots\ldots (5.)$$

$$\frac{5}{8}P + \frac{25}{7}P_1 - \frac{32}{7}P_2 = T \ldots (6.)$$

$$\frac{13}{32}P + \frac{41}{9}P_2 - \frac{50}{9}P_3 = T \ldots (7.)$$

$$\frac{61}{200}P + \frac{61}{11}P_3 = T \ldots\ldots (8.)$$

Whence we obtain

$$P = \frac{3891100}{1257759}T.$$

$$= 3\ T \text{ very nearly.}$$

We do not see any flaw in this calculation; and if it be correct, it certainly would seem that Dr. Hart's assumptions are not far from the truth.

That there may be the same normal mutual action (P_1, for example) between the cylinders, while one may be in a state of considerable extension, and the other of compression at the surfaces in contact, we have satisfied ourselves by the following considerations:—Let a cylinder, whose external and internal radii are equal to R and r, respectively, be shrunk on to another cylinder originally in a state of neither extension nor compression, so as to produce upon it the pressure P_1, and let the radii of the inner or compressed cylinder be r_1 and r. We have for the outer cylinder the equations:

$$n=P_1 \frac{R^2-x^2}{R^2-r_1^2} \frac{r_1^2}{x^2},$$

$$t=P_1 \frac{R^2+x^2}{R^2-r_1^2} \frac{r_1^2}{x^2},$$

for the inner

$$n=P_1 \frac{x^2-r^2}{r_1^2-r^2} \frac{r_1^2}{x^2},$$

$$t=-P_1 \frac{x^2+r^2}{r_1^2-r^2} \frac{r_1^2}{x^2},$$

Let now $x=r_1$ for each cylinder.

Then n is the same for both.

But for outer cylinder $t=P_1 \dfrac{R^2+r_1^2}{R^2-r_1^2}$,

and for inner cylinder $t=-P_1 \dfrac{r_1^2+r^2}{r_1^2-r^2}$,

or of the surfaces in contact, that of the outer cylinder is in a state of considerable extension, that of the inner in a state of considerable compression.—Ed. M. M.]

The Iron Question: Considered in Connection with Theory, Practice, and Experience, with Special Reference to "the Bessemer Process." By Joseph Hall. London: Hamilton, Adams, and Co., Paternoster-row. 1857.

This volume opens with a newspaper extract,* and three pages of comment thereon, relating to a challenge offered by Mr. Hall, the author, to Mr. Bessemer, at the London Polytechnic Institution. Between pages 35 and 41 are given a few contemptuous observations respecting the injurious effects produced by certain articles in the Metropolitan Journals on Mr. Bessemer's process. With these exceptions there is no mention of that process in the entire body of the work, which is wholly taken up with a narrative of the life, recreations, and labours of Mr. Joseph Hall, of the Bloomfield Iron Works, Tipton, Staffordshire, and with statements and testimonials setting forth the extraordinary excellence of the iron produced at those works. We cannot possibly be mistaken, therefore, in assuming that "the Bessemer Process" has been introduced into the title page, simply in order that public attention might be drawn to Mr. Hall's little effort; and certainly the attraction was by no means unnecessary!

Mr. Joseph Hall, who, in 1806, started from home, as he tells us, to seek his fortune, will add but little to his success in this respect by the publication of this ill-conceived, ill-executed, and ill-destined book. Its issue is a great mistake, for three reasons: first, because it claims for Mr. Hall much that does not belong to him; secondly, because it refuses to others what does belong to them; and thirdly, because it proves that Mr. Hall has been occupying himself for nearly half-a-century with the invention of improvements that were made and practised years before he was born.

Mr. Hall claims, page 91, to be the "originator and inventor of the *principle* of boiling iron." He mentions "principle," but he means the process of boiling iron—for how can a man invent a principle? He distinctly claims, however, in several places, to be the inventor of the boiling process, and asserts that Cort's invention went no further than "dry pig-puddling." What are the real facts of the case, as demonstrated by the publication of the specifications of Cort's patents? We will detail them—probably to the astonishment of Mr. Hall. Whether Mr. Cort's was, as Mr. Hall so positively asserts, a mere puddling process, may be gathered from the following extract from the patent of Cort of 1784:

"For the preparing, manufacturing, and working of iron from the ore, as well as from sow and pig metal, and also from every other sort of cast iron (together with or without scull and cinder iron and wrought-iron scraps), I make use of a reverberatory or air furnace or furnaces, of dimensions suited to the quantity of work required to be done, the bottoms of which are laid hollow, or dished out so as to contain the metal when in a fluid state. My furnace, for the first part of the process, being got up to a proper degree of heat by raw pit-coal or other fuel, the fluid metal is conveyed into the air furnace by means of ladles or otherwise. When this air furnace is charged with sow and pig metal, or any other sort of cast iron, the door or doors of the furnace should be closed till the metal is sufficiently fused; and when the workman discovers (through a hole which he opens occasionally) that the heat of the furnace has made a sufficient impression upon the metal, he opens a small aperture or apertures, which I find is convenient to have provided in the bottom of the doors (but which is or are closely shut, as well as the

* This extract was from the *Mining Journal*, as Mr. Hall must, we imagine, have known; it is, however, unacknowledged.

doors, at the first charge of the furnace with cold cast metal); and then the whole is worked and moved about through these apertures by means of iron bars and other instruments fitly shaped, and that operation is continued in such manner as may be requisite during the remainder of the process. After the metal has been some time in a dissolved state, an *ebullition*, *effervescence*, or such like intestine motion takes place, during the continuance of which a blueish flame or vapour is emitted; and during the remainder of the process the operation is continued (as occasion may require) of raking, separating, stirring, and spreading the whole about in the furnace till it loses its fusibility, and is flourished or brought into nature; to produce which effect, the operations subsequent to the fused state are the same, whether the fusion be made in the air furnace or the metal be conveyed into it in a fused state, as first mentioned."

Again: "And the whole of the above part of my method and process of preparing, manufacturing, and working of iron is substituted, instead of the use of that finery, and is my invention, and was never before used or put in practice by any other person or persons."

Here then we have Cort the inventor, among other things, of the boiling process. The description of the process is so graphic, that no one acquainted, even ever so slightly, with iron manufacturing, can confound it with the puddling process. The words "*ebullition*," "*effervescence*," cannot by any sophistry be made to refer to puddling refined metal. But Cort must be considered the inventor of the puddling also, for though the refining was considered an improvement on his original patented mode, the use of the finery does not dispense with Cort's reverberatory furnaces. The refinery is merely an addition to Cort's invention, and its use in nowise detracts from his merit. Mr. Hall writes as if Cort's puddling had been supplanted by some newer method, when in fact, all that has been done has been in the way of carrying out Cort's original great discoveries.

Mr. Hall claims the use of cinder in the "boiling" process as the second of his inventions—the first being the "boiling" process itself. But here also he has been anticipated by Cort, who, thirty years previously, showed that cinders might or might not be used, at the pleasure of the operative.

Mr. Hall's third invention, the use of calcined tap cinder, as a repairing material, may, for aught we know, properly belong to him; but the use of this cinder seems to deteriorate the iron, since it contains from 4 to 7 per cent. of phosphoric acid. In Wales the manufacturers do not use the calcined cinder as a repairing material. Some few years ago the Staffordshire iron brought the best price; now Welsh fetches the highest (we allude to the average of orders) and complaints are general that Staffordshire qualities have greatly deteriorated. May not this be owing to the general use in that district of the calcined tap cinder?

But we must object to the manner in which Mr. Hall puts forth his claims as the inventor of important processes. Mr. Bessemer's paper appeared in August. If Mr. Hall was aggrieved by the notice taken of this paper (as he appears to be), why did he not notice it at once? Why leave it till December before we have anything from him? For three months and more Mr. Hall never wrote a word in any paper as to his claims in iron making. He ought to explain this omission. He was all along aware of Mr. Bessemer's claims, and yet for months he is silent; then he falls foul of Cort, Bessemer, and the whole race of inventors.

Further, Mr. Hall tells us that his discoveries were made so far back as 1816, or forty years ago; yet the first announcement of them that we have is in 1857! If Mr. Hall discovered anything in 1816, why did he not publish it? Or if of any value, and original, why not patent it?—for he admits that he patented other things. It would seem that he kept it secret, or at any rate if others knew of what he discovered, it was from accident. Now a man has not a tittle of claim to merit for a discovery which he never published nor took pains to disseminate. Had he taken out a patent, like Cort and others, that of itself would be a publication to the world of the entire process. But he did nothing of the kind; for we are nowhere referred to any publication or document in support of the claim, nor have we the testimony of one single person as to the correctness of Mr. Hall's statements.

Weighing Mr. Hall's pretensions by his own statements, he has no claim whatever as a meritorious inventor; while his attempt to usurp the invention of the boiling process—a process so fully described in Cort's specification—is anything but creditable to him. We must hope that his denial of Cort's claims originated with him through ignorance of what Cort invented and patented.

We have no wish to find fault with the style of a book written by a practical man; but we cannot help remarking that, throughout the pages of this book, the author is profuse as to what *he* can accomplish in the way of iron making, and of his wonderful dexterity in producing any desired qualities; but we look in vain for a description of the method by which any one quality may be developed. The sole purpose of the book seems to be the setting forth of Mr. Hall's presumed discoveries and unequalled iron. A perfect mystery is observed as to the means employed; the several minute details so ably described in Cort's specifications, and without which no one could understand the rationale of a complex

operation, are carefully suppressed. Probably they are considered trade secrets, which it is undesirable to publish.

Mr. Hall is somewhat loose in his statements,' as any one can see by his confident assertion that he can "vaporize" any quantity of cast-iron. He mentions his having charged 4 cwts. of iron into a furnace, 3 cwts. of which were vaporized, *except* so much as was obtained in the scoria. It does not seem to have struck Mr. Hall that the 3 cwts. were in the scoria in the form of protoxide of iron. A trifling loss occurs in melting iron, for the great draught may well carry up some particles, but in the large way the loss is very accurately balanced by the iron in the cinder.

WATER GAUGES FOR BOILERS.

THE QUEEN *v.* TRURAN.

In November last, Thomas Evans, Esq., one of her Majesty's Coal Mine Inspectors, laid an information before the Merthyr Tydvil magistrates against the defendant (the engineer of the Dowlais Iron Company), for an alleged violation of the seventh general rule of the Coal Mines Inspection Act, wherein it is required that each boiler used in mining engines shall have, amongst other appendages, "*a proper water gauge.*" The defendant contended that the ordinary gauge cocks were a proper water gauge in the meaning of the Act; to this the inspector joined issue. After four several hearings, and the examination of a large number of witnesses on both sides, the Magistrates decided on the 12th inst., that the defendant's construction of the rule was the correct one, and that the government inspectors generally have taken an erroneous view of the subject. The judgment of the magistrates is a long and elaborate review of the whole of the evidence adduced, and well worthy of perusal. To the owners of mining engines, and to engineers generally, the decision is one of such great importance, that we have had drawn up a summary of the evidence given on the several occasions.

It may be proper to mention, that the boilers alleged by the inspector to be unprovided with a proper water gauge were of the cylindrical form, with plain hemispherical ends, the fire underneath, and no internal tube or flue. They ranged from 6 ft. 6 in. to 7 feet in diameter, and 38 to 42 feet long, and supplied steam to a 24-inch engine, working at an average speed of 85 feet per minute through the day. The pressure ranged from 35 in the lowest to 50 lbs. on the inch in the highest. Two, but in several three, cocks were fixed as gauges, the lowest nearly 12 inches above the highest level of the exterior flues. Each boiler had two safety valves, and with one or two exceptions, had self-acting alarum whistles, which gave notice of any impending danger through lowness of the water. It will be seen that owing to the large body of water the rate of evaporation did not exceed 2 inches per hour. The last explosion at Dowlais through shortness of water occurred with a tubular boiler in 1841. The company have about 90 boilers constantly at work, all high pressure.

The following evidence was offered on the part of the Crown:

Mr. Wm. Fairbairn, *Engineer, Manchester.*—The ordinary cocks, as applied to steam boilers, do not form a proper water-gauge. The gauge-cocks were formerly depended upon; but, of late years, the glass gauge, which is a far better indicator, had in a great measure supplanted them. Always fits his engines with cocks and glass tube. The cocks were useful if the tubes became choked or fractured. It had not been the practice in his district for the last twelve or fifteen years to fit up boilers with cocks alone. The glass tube is the best gauge, because it shows the exact height of the water, whereas two gauge-cocks only show the two extreme points. No one could tell with them whether the water was nearest to the upper or lower cock. He never found that there was any great objection to the tube on account of the foulness of the water. If the tube got fouled, it could be washed, or thrown away, and a new one added. In Manchester they had a great many explosions, perhaps a fifth or sixth from insufficient water—the others from excessive pressure. Was an advocate of very strong pressure. Had written a treatise on the steam engine, in which he laid it down that whatever kind of gauge was used, the most important point was to have careful and steady engine-men to attend to them regularly. Looking at a sketch of the Dowlais boilers, believes that if they were attended to by a careful engine-man, who would try the cocks every quarter of an hour, they could be safely worked.

Mr. G. Rennie, *Engineer, London.*—Considers the glass tube the best gauge. The cocks do not show the exact height. When the cock is opened, a vacuum is formed in the steam by the atmospheric air rushing in,* and the water will rise to fill up the vacuum, and then will rush out. These boilers have the cocks horizontally with the water, which prevents the water rising to so high a point. The float is a proper gauge to some extent. It is apt to stick; but the engine-man must look to this. Saving this, the float is a true gauge, and indicates the height of the water in the boiler. All our engines are fitted with three cocks and a glass gauge. The tube may get discoloured or choked up; but these difficulties may be removed by rinsing, cleansing, &c.

Mr. C. Dinnen, *Engineer to the Board of Admiralty, and Inspector of Machinery Afloat.*—I consider the cocks alone not to be a proper water-gauge for a boiler. I think the float is not a proper gauge alone, as it cannot be relied on at all times on account of its sticking. I consider the glass tube the best gauge if only one is used. If it gets choked, it is the duty of the engine-man to notice the circumstance and clean it. All our marine boilers have a glass gauge and three gauge-cocks, and I would never on any account pass a boiler not so fitted.

* How can the air rush into a boiler containing steam at a minimum pressure of 35 lbs. to the square inch above the atmospheric pressure?—*Reporter.*

Mr. Ramsay, *Engineer and Inspector of Engines to the Board of Trade.*—In my opinion, the gauge-cocks alone are not a proper water-gauge. Both the float and glass tube, when in working order, are perfect gauges; but I prefer to have two instruments. If I found an engine with only one gauge, I should insist upon another being added.

Mr. R. B. Longridge, *Inspector to the Manchester Association for the Prevention of Boiler Explosions.*—The boilers I inspect are variously fitted; cocks and floats, cocks and glass gauges, floats and glass gauges, and, in some cases, two floats or two glass gauges. The float and the glass tube are the only proper gauges. We have many boilers without cocks, but they have two glass gauges, two floats, or a glass gauge and float. The cocks do not show the level of the water in the boiler. Opening the cock relieves the pressure, and water will issue, though the level of the water in the boiler is much below the orifice. The water will jump up two or three inches. If the water level is three inches below the orifice, the cock will discharge water. If the water level is three inches above the orifice, the cock will discharge steam and water. By the cock it is impossible to say within two or three inches where the level of the water may be. The float truly indicates the height of the water in the boiler. It is liable to stick; but this can be ascertained by trying occasionally. The cocks will not show the true height when the boiler is priming. The float would show it by the mean of its oscillations. The glass tube, by blowing through it, will show the average height during priming.

Mr. Reed, *Engineer, Newcastle-on-Tyne.*—Considers the float and glass gauge a proper water-gauge. The cock does not give the exact height of the boiler. This defect is very apparent when the boiler is priming. The glass tube and float leaves the man more at liberty—he has more time on his hands. Agrees with Mr. Rennie that "a proper water-gauge" should consist of two instruments, the glass tube to be one of the instruments so employed.

Mr. Polter, *Mining Engineer in the Northern District.*—The cocks were not a proper water-gauge, as they gave no indication of the water above and below the orifices. Glass gauges have generally a larger range, and give true indications. Does not think it safe to depend on cocks alone. Did not consider the cocks a gauge. A number of his boilers had cocks and the glass tube. In his district, boilers were not generally worked with cocks alone.

Mr. J. Brown, *Mining Engineer, Barnsley.*—His boilers were fitted with floats and glass gauges. Cocks alone were not depended on in his district. He would not say that the Dowlais boilers could not be worked safely with cocks alone; believed they might if the cocks were tried every quarter of an hour; but the difficulty was, to get the men to attend to them regularly. They would be improved by the addition of the glass tube. The cocks were not a water-gauge. They did not give the height of the water,

Mr. Martley, *Locomotive Superintendent, South Wales Railway.*—Considers the ordinary cock alone not a proper water-gauge. It is, in combination with the glass tube, the best gauge for locomotive engines.

Mr. T. Wynne, *Inspector of Mines.*—Cocks alone are not depended on in his district. The cocks are not a water-gauge at all. The float or glass gauge were proper gauges, because they showed the exact height of the water. The float was liable to stick; but if the engine-man saw it move, he knew it was not sticking. Looking at the drawing of the Dowlais boiler, he should say that, at the place the cocks were fixed, if a careful engineer went to the cocks and tried them every quarter of an hour, they could be worked safely. But could this attendance be insured? The floats also required attendance, but not so frequently.

Mr. Higson, *Inspector of Mines.*—The cock is not a proper arrangement. Considers the float and glass gauge perfect instruments when in proper order. There ought always to be two instruments. The Dowlais boilers may be worked for years with perfect safety, and be fitted only with gauge cocks; but a boiler may be safe to-day and blown up to morrow.

For the defendant the following evidence was adduced:

Mr. E. Woods, *Engineer, London (formerly chief engineer on the Liverpool and Manchester Railway).* Considers the gauge cocks to be a proper guage. They are a safe gauge, and give certain indications which cannot be mistaken by those using them. They are not liable to be damaged. There is no instrument that will gauge the water in the boiler without attention on the part of the engine man. The float is very liable to stick and give a false indication. The sticking of the float is a very common occurrence, and it cannot be seen in the dark. The indications of the gauge cock can be distinguished by their sound, there is no mistaking it. The glass gauges choke, and there is trouble in cleaning them. The tubes break, and where, as in this case, the boilers are in constant work it is difficult to replace them. They do not generally bear the sudden temperature. The glass tube and float indicate the exact height of the water. Objects to the float on account of its sticking and misleading the engine man. If he had only one instrument, should prefer the cocks. They form the most proper and essential gauge.

Mr. Captain Dicey, *late of the East India Corps Service, Calcutta.*—Considers the cocks to be the most important gauge. Would never pass a troop ship unless the boilers were fitted with them. Would not depend on glass tubes, as they frequently choke when using muddy water. The cocks show the relative position of the water in the boiler. Apart from the liability to stick, the float shows the true height of the water; with a careful engineman, the float would be a true gauge.

Mr. R. Pollock, *Engineer, London.*—Considers the gauge cock the safest indicator of water in the boiler. Always put three cocks to their boilers. The lowest cock is fixed at the danger point. Would never trust to an engine without gauge cocks. The glass tube is liable to break, and the fragments may be blown in the engineer's eyes. The tube is liable to choke. Has never known an accident to have arisen where the cocks have been properly attended to. The float does not give true indications with muddy water, as the accumulation of matter on the stone makes it sink deeper.

Mr. Bush, *Engineer, Bristol.*—Considers the cocks a proper water gauge. Usually applies three cocks, but believes an engine having two might be worked with safety. Frequently adds the glass gauge. Never sends out an engine without gauge cocks. The cocks indicate only the comparative height of the water. The tube is a more accurate gauge if kept in perfect order.

Mr. T. Murray, *Engineer, Chester-le-street, Durham.*—About two-thirds of their boilers are fitted with floats, and one-third with cocks. Prefers the cocks for safety, because the engineman is under the necessity of trying them continually. If there are two instruments, the float and cocks, the engineman is apt to neglect the latter till they cannot be turned. The float is frequently out of order. The glass tube shows the exact height when not stopped up, or discoloured. Frequently it cannot be seen through. Would not trust to a glass tube. Apart from its liability to stick, the float is a proper gauge.

Mr. R. Hosking, *Engineer, Perran Engine Works, Cornwall.*—We fit gauge cocks only to our boilers. Consider the cocks the safest and most proper gauge of any. Glass tubes are not used in Cornwall to the mining engines. Has found the float very liable to stick and give false indications. Was once placed in great personal danger from this cause. Whilst superintending the working of a new engine, the float stuck fast; and, relying on its presumed efficiency, the water descended until the tube collapsed. Floats cannot be used to many of the Cornish engines, because of the corrosive action of the water on the wire; nor could glass gauges be used unless these had silver or platinum fittings. Silver gauge cocks are used at some mines.

Mr. B. Fothergill, *Engineer, Manchester.*—Considers the cocks to answer every purpose of a safe and proper water gauge. They did not give the exact height. The tube and float gave the height when in working order. The glass tube was liable to be choked. The float is fitted to many of the Manchester engines. Has known the glass tube give false indications. A locomotive which he tried primed, and the glass gauge failed to indicate the state of the water, and he had to rely on the cocks. Would not trust his life on such an engine without cocks. The Manchester engines were principally fed from the canal and water works. Places the bottom cock as a final test when the water has left the tube.

Mr. H. Jones, *Manager, Old Park Iron Works, Wednesbury.*—Considers the cocks a proper gauge. In all cases the ultimate dependence of the engineman was on the cocks. Fitted his boilers with cocks only, unless otherwise specially requested. Considers the glass gauges imperfect from their frequently registering falsely when using dirty water. The tube is liable to be fouled, and then the engineman relies on the cocks, till another is substituted. The cocks do not measure the exact height of the water. The glass tube is inoperative when the water falls below the lower orifice, entering the boiler. The lowest gauge cock is placed sufficiently far above the danger point.

Mr. G. Elliott, *Mining Engineer, Howden Hall, Durham.*—Considers gauge cocks a proper water gauge, and perfectly safe when properly attended to. Has 146 boilers under his care variously fitted. Considers it the better plan to retain the gauge to which the men have been accustomed. Would not change cocks for floats, nor *vice versâ*. The cocks did not give the exact height, but they gave it, when properly fixed, sufficiently near to prevent danger. The floats when in action gave the true height, but if the water descended lower than usual, they were not to be depended on. The wire would stick where it had been rusted by non-use. Was examined before the committee of the House of Commons on this question. The committee would not bind themselves to any one gauge in particular, but let it stand "a proper water gauge, as the most comprehensive." Considers an instrument that will at all times show the height of the water, sufficiently accurate to prevent danger, a proper water gauge.

Mr. E. Rogers, *Abercarne, Mining Engineer.*—Had employed the glass tube, but it immediately got discoloured by the mineral impurities of the water, and the level could not be seen. The water corroded tubes so that they could not be cleaned. Resorted to floats, but found them very uncertain in their action in high-pressure boilers. There was danger through the men looking at the float and neglecting the cocks; and from this cause alone he had two or three narrow escapes of explosion. The Cornish engines were all worked with cocks, and yet they had fewer explosions than in any other district, yet the water level was but a few inches over the tube. Considers the water gauge an instrument to indicate the quantity of water sufficiently accurate to prevent explosions.

Mr. G. P. Hubbuck, *Manager of the Rhymney Iron Company.*—Glass gauges require very great attention where the water is dirty, as in these boilers. It is also very liable to choke with the deposit of sediment. Considers the gauge cocks far superior to the glass tube. The float is liable to stick and mislead the engineman. One great advantage of cocks is that the sound indicates to the engineman whether water, steam, or both are issuing. A light is necessary with the float and the glass tube. The water will sometimes boil around the tube of the glass gauge, and deceive the man. Would not have an engine without gauge cocks.

Mr. W. Manelaus, *Manager, Dowlais Iron Company.*—Considers the cocks the best gauge. Enginemen contract a habit of trying the cocks frequently—every quarter of an hour or so. Although the gauge cocks only show two points, the glass tube is confined to the same range, and becomes inoperative out of these points equally with cocks. The engineman is guided by the sound when using the cocks. Other gauges require a light; and believes the engineman would neglect going often if obliged to prepare and carry a lamp at night. The float is dangerous at times, and ought not to be trusted. The glass gauge does not always indicate truly.

Mr. J. Roe, *Bridgend, Engineer.*—Considers cocks the most proper gauge. They never give a false indication, for if out of order, the circumstance cannot fail detection. The sound of the gauge cocks is decisive, that no one can mistake it. Of the three gauges—cocks, floats, and glass gauges, would trust to the first only.

Mr. C. Pearce, *Engineer, Cyfarthfa Iron Works.*—Has confidence in the gauge cock. At his works there are about seventy boilers, and no explosion has occurred these forty-five years. The floats fail and mislead the men. Besides, where the men have other indicators, they are apt to neglect the cocks.

Witness held up two glass tubes which had been to a locomotive three weeks, one full of water, the other empty, and requested the Court to point out the one containing water. The action on the glass had been such that no one present would venture an opinion as to which contained the water.

Mr. D. Williams, *Engineer, Rhymney Iron Works.*—Believes the gauge cocks to be the most perfect and reliable water gauge discovered. Was engineer at Dowlais when the late Sir John Guest supplied the stationary engines of that works with glass tube gauges. After a fair trial, they found the glass tube did not answer, and they abandoned them as worse than useless under such circumstances as existed there.

Mr. T. Ellis, *Engineer, Tredegar Iron Works.*—Considers the cocks the best gauge. Always depended altogether on cocks. Would not depend on floats, as they were so liable to stick and deceive the engineman. Prefers two gauge cocks, as the simplest arrangement of gauge. Had had boilers burst, but not from deficiency of water.

(It may be remarked, that the decision for the defendant seemed to have turned, in a great measure, on the witnesses for the prosecution insisting on two gauges as the most proper arrangement. Unfortunately for their view of the matter, the act refers to *a* gauge, and the magistrates declined to order two gauges where clearly only one was specified.—*Reporter.*)

HEARDER'S INDUCTION COIL.

Mr. Jonathan N. Hearder, of Plymouth, whose powerful induction coil we have already brought under the notice of our readers, has, during the past fortnight, delivered lectures upon the improved coil and other electrical matters, at the London Institution and the Society of Arts. As we purpose giving an account of the London Institution lectures in an early Number, we will now merely state that our high opinion of the Hearder coil has been fully confirmed by many persons eminent in electrical science, including Mr. Grove, Q C., who presided at the meeting of the Society of Arts, and bore testimony to the originality and importance of Mr. Hearder's improvements.

LENGTHENING AN IRON SHIP.

The *Candia*, a screw steamer, of 2,250 tons, is being lengthened amidships thirty-five feet, at Mr. Laird's yard, Birkenhead. The ship having been docked and shored up, and the fore half cradled upon a launching way, tackles were attached to rings placed in the stem, and the fore half drawn from the other by the aid of winches. The lengthening piece, previously framed, plated, and taken to pieces, is now being introduced. As soon as the *Candia* is completed, the *Colombo*, of 1,800 tons, will be similarly lengthened.

ON SUPERHEATING STEAM.

To the Editor of the Mechanics' Magazine.

Sir,—In my communication in your Number for February 14th, I ventured to make a little free on the subject of fuel consumption, with my much esteemed friends, the practical engineers. In taking leave of the matter in your journal, I make the *amende honorable* by offering them a present, be its value little or much, and in any event a good intention goes with it. The act of superheating steam is *per se* open to them already, as to the community at large, if it be only from what I have myself practised more than twenty years back; effected tôo by the unexhausted heat, after vaporising the water. The method of applying it, now to be described, is henceforth theirs also. If not wholly acceptable, it may at least be suggestive of some analogous means improved under their more able hands.

The essential principle of this method is the transference at will by means of heated air of the waste heat from the funnel or uptake, to the surfaces of the steam pipes, and, where practicable, to the cylinders and slide cases. To effect this, fix a casing around the funnel as far up as the heat directs, arrange a spiral passage within it, and let the upper part communicate with the atmospheric air. Connect the lower and hottest end of this with a casing carried around the steam pipe up to the cylinder valves, and, *whenever practicable*, around the valve cases and cylinders also. Lead from thence, fitted with a regulator, a return pipe to the *interior* of the funnel, the unbalanced column of hot gases within which (the draught) will draw the heated air from the funnel case, and circulate it around the steam pipe and cylinder, its heat being imparted to the steam within them; for air though a bad conductor, actively acquires and imparts heat by impingement. A thermometer placed near the cylinder valves will indicate the temperature of the steam and the required adjustment of the regulator. The exterior of the hot-air casings should be doubled, and the interstice filled with a non-conductor. Thin iron plate will answer the purpose, nor need it be absolutely tight. Where the heat of the funnel is not sufficient to overcome the differential temperature of the external air with regard to that of the heated air, the latter can be returned to the casing and re-circulated by means of any obvious motor; and in most instances this might probably be necessary, and ultimately advantageous. In land engines, where the chimney is of brick, the air chamber can be fixed internally.

As I stated in your former Number, I do not anticipate a great saving of fuel from the mere fact of superheating steam as opposed to the vaporisation of the water, my faith lying in the comparative efficiency of it as the prime mover of the engine, as there explained. And if this be a correct view, a small extent of superheating, and completely desiccating the steam, will quite answer the purpose to be attained, namely, the saving of fuel, by causing the steam to maintain its persistency to the termination of the stroke, and especially when worked expansively.

Here we effect what is desired, and under the most easy control, without risk of damage or any change whatever within the boiler or in the moving parts of the engine, and I doubt not, from experience on this head, though under a different application, that the method is quite practically applicable. There is one alteration, however, that may be needed, namely, a larger surface of steam pipe to absorb the heat. and the more so in large engines, since the surface of the pipes is inversely as their area, and so with regard to the funnel; but the engineer could have no real difficulty in making the needful correction, by subdivision or otherwise. I estimate the

heat at the base of and within the funnel, generally to approach 500°.

It should be remembered, that the *latent* heat of steam is the *sole*, though hidden cause of the energy of the engine. This is nearly 1000° Fahr., and all else is but hot water of no effect, and most detrimental in the cylinder; or if the added (super) heat be computed, it increases the expansion only by the law holding with air or other permanent gases, namely, but a 480th part for every degree additional, at least in my acceptation, though not, it would seem, in that of some others who are now travelling on the same road. Then, if we have 12 feet per horse power to obtain the vaporising effect in boilers, and if we need but an extra dose of caloric say of 20°, after the water in vaporising has imbibed the 1000°, (though we might carry it higher perhaps) to effect the purpose of permanence of elasticity, one-fiftieth of the boiler surface will be sufficient for that of the steam pipe and cylinder, or a quarter of a foot per horse power; supposing we obtain an effect comparatively equal to that of the fire and flues in the water spaces. The waste heat is probably not less than a tenth part in most marine boilers, and if, in accordance with the above view, we arrest and apply a fifth of this, the operation is accomplished.

I remain, Sir, yours, &c.,

THOMAS HOWARD.

King and Queen Iron Works,
Rotherhithe, Feb. 17, 1857.

INSTRUMENTS FOR OBSERVING THE MOTIONS OF CLOUDS.

To the Editor of the Mechanics' Magazine.

SIR,—As you lately published Dr. Bagot's statement at the Royal Dublin Society, of Dublin, regarding the observation of the clouds, I feel assured you will do me the justice to insert the accompanying paragraph from *Saunders's News Letter and Daily Advertiser*, of 31st January last. Allow me at the same time to explain, through your columns, that it was in regard to the connection subsisting between the motions of the higher clouds and the weather wherein I was anticipated by Dr. Bagot, and not with reference to the first use of *instruments* for observing those motions. The first published description of an instrument for this purpose, so far as I am aware, was by me, in the *Edinburgh Philosophical Journal*, for July, 1855. The instrument designed by Dr. Bagot, and brought before the Royal Dublin Society, in January, 1857, is, however, different from mine, and is considered, by him, as superior to mine in several respects.

I have only to add, that I am perfectly satisfied with the statement of Dr. Bagot which is hereto annexed.

I am, Sir, yours, &c.,

THOMAS STEVENSON.

Chambers, 84, George-street,
Edinburgh, Feb. 14, 1857.

ROYAL DUBLIN SOCIETY.

A sectional meeting was held last night in the Society House, Kildare-street:

The Rev. Professor Haughton, F.T.C.D., in the chair.

Doctor Bagot said—Before the regular business of the evening commences, I beg leave, Mr. Chairman, to make a short explanation relative to a paper I read at the last evening meeting. On that occasion I alluded to Mr. Thomas Stevenson, of Edinburgh, as having brought out as novel some ideas of mine relative to the motions of the upper strata of the clouds, read before the society in 1849. Mr. Stevenson having met a report of my communication in *Saunders's News Letter*, wrote to me from Edinburgh, assuring me that he had never before seen or heard of my remarks upon the clouds, and hoping that I would publicly remove the seeming imputation I had cast upon him of appropriating my observations. Since the reception of Mr. Stevenson's letter, I have heard from a gentleman, high among the scientific men of this country, that Mr. Stevenson is a gentleman entirely above such plagiarism, from his high moral and scientific character. I therefore not only entirely acquit him of a reproduction of my observations, but also regret that I should have caused any annoyance to so estimable a gentleman as he has been represented to me. It has given me great pleasure to know that my observations have been so fully borne out by those of another gentleman in the sister country.

OBSTRUCTIONS IN GUN-NIPPLES.

To the Editor of the Mechanics' Magazine.

SIR,—The obstruction or fouling in gun-nipples from the firing of gunpowder, necessitated the invention of an ingenious instrument like that of Messrs. Paton and Walsh, represented in "The Field" of the 7th inst.; gun-cotton cartridges have this advantage over gun-powder, that the nipple of the fire-arm (if even a small revolver) is never fouled by the firing of gun-cotton.

I am, Sir, yours, &c.,

J. NORTON.

Rosherville, Feb. 16, 1857.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BAKEWELL, F. C. *Improvements in percussion bomb shells.* (A communication.) Dated June 17, 1856. (No. 1430.)

The instant explosion of the shell is accomplished by inserting into the powder chamber a percussion apparatus, the outer extremity of which projects from the heavy end of the shell. When the shell is to be fired from a rifle-bored cannon, it is made of a cylindro-conical shape, and is furnished with a sabot of lead at the butt end. When to be fired from a mortar, the sabot is dis-

pensed with, and the percussion end is made heavier than the other.

Berenger, R. L. de. *Improvements in nosebags.* Dated June 18, 1856. (No. 1434.)

The head-gear of nosebags is so arranged that, upon the fodder being eaten, the nose-bags may be caused to fall or rise proportionately, by elastic materials connecting the head-gear with the sides of the bags.

Burton, T. *Improvements in machinery or apparatus for sizeing and dressing warps, yarns, or threads.* Dated June 18, 1856. (No. 1435.)

Instead of passing steam to the size trough and drying cylinders simultaneously, the patentee passes it from the boiler direct to the cylinders, and then conveys the exhaust steam from the cylinders to the size trough.

Tucker, W. H. *Improvements in locks and latches.* Dated June 18, 1856. (No. 1436.)

These improvements consist chiefly of various additions to, or modifications of, the ordinary double-action tumbler locks and latches with fixed tumbler stumps, by which the possibility of feeling the positions of the tumbler gratings by the aid of end pressure against the bolt is prevented, without reducing the strength of the locks, as is the case in locks wherein the tumbler stump is moveable.

Muir, M. A., and J. McIlwham. *Improvements in looms for weaving.* Dated June 18, 1853. (No. 1437.)

This invention in some respects refers to former patents of the patentees, dated 5th Dec., 1853, and 23rd Jan., 1854, and comprises the use of apparatus for shifting the shuttle drop-box or boxes in looms for weaving with more than one shuttle, the use in such looms of a pattern barrel formed with spirally-disposed perforations, to receive pins of various sizes corresponding in number to the number of shuttles used, &c.; the use in looms of a spring or elastic connection for aiding the action of the shuttle drop-box movement; the use in looms for weaving ornamental fabrics of the corded class, of connected shuttle drop-boxes on each side of the loom working in concert; and a mode of connecting the shuttle drop-box of looms working more than one shuttle with the taking-up motion of the loom, so that the taking up may be varied according to the shuttle in use.

Clifford, C. *Improvements in boat lashings and in blocks and apparatus used for raising and lowering boats and other articles.* Dated June 18, 1856. (No. 1438.)

A description of this invention was included in the article on Mr. Clifford's apparatus given at page 97, No. 1747.

Sharpley, C. P. *Improvements in paddle-wheels for propelling vessels.* Dated June 18, 1856. (No. 1440.)

In place of floats the patentee substitutes a continuous annular spiral paddle, and fixes it so that the plate forming such paddle shall enter and leave the water edge first.

Tillett, G. *Improvements in bedsteads.* Dated June 19, 1856. (No. 1441.)

This relates to modes of joining the side and end rails of bedsteads to the posts. According to one form the post (if wooden) is morticed, and in the mortice, on one side of it, is fitted a metal plate having projecting inclines on its face. The tenon is a thin metal tongue, secured into the rail. On one side of it are studs which, when the tenon is introduced into the mortice, project behind the inclines, and tighten the joint.

Hunt, W. *Certain improvements in machinery or apparatus for polishing and finishing yarns or threads.* Dated June 19, 1856. (No. 1442.)

The yarn or thread *in the hank* is passed, when wet or previously sized, over and around revolving rollers, stationary rods (or beams) and steam chests (or tanks). The rods are covered with cloth, which lays the fibres. The hank is (simultaneously with the laying of the fibre) dried and polished, on both the inside and outside surfaces of the thread, by the revolving rollers and steam chests.

Spilsbury, F. G. *Making soda and alum.* Dated June 19, 1856. (No. 1443.)

Claims.—1. The extraction of caustic soda from cryolite by caustic, lime, and water. 2. The fluxing of wolfram with cryolite, as well without as with the subsequent application of lime. 3. The application of sulphuric acid, with or without an additional portion of clay, to cryolite, for producing alum.

Molesworth, G. L. *An improved pendent child's cot.* Dated June 19, 1856. (No. 1444.)

The cot consists of a stiff frame, to which the body (of sacking, or of cane or wicker work) is attached. Cords are attached to the frame so that the cot may be hung to rings or hooks in the ceiling, or wall, or from part of a bedstead, so that the child will constantly be within reach of the mother or nurse.

Schwartz, T. *An improved brick.* Dated June 19, 1856. (No. 1445.)

The inventor removes vertically from the central portion of the brick such a quantity of the material as can be dispensed with, and gives a peculiar configuration to the cavity.

Pye, G. *An improvement in preparing silk.* Dated June 19, 1856. (No. 1446.)

Fuller's earth is used to aid in removing gum from the silk. It may be used combined with water when reeling silk from the cocoons, and also with water, steam, and pressure after reeling.

PARSONS, W. *Improvements in washing and bleaching woven fabrics.* Dated June 19, 1856. (No. 1448.)

The washing is effected by a machine consisting of a four-sided frame, which revolves on a horizontal axis in a cistern of boiling water. At one angle of the frame a reel is mounted, on which the fabric to be washed is wound. In the centre of the frame is another reel. The cloth from the full reel passes round three sides of the revolving reel over brushes, or a surface of vulcanised india-rubber, to the central wheel, which receives a slow motion on its axis by gearing, and just before the cloth is wound on the central reel it is acted on by a revolving brush or surface of vulcanised india-rubber. When the central reel is full of cloth it is removed from this washing machine to an improved apparatus in which the cloth is subjected to the action of the various liquors used in bleaching.

DAMAZIO, J. D. *A new process of making illuminating and heating gas by a double distillation without retort.* (A communication.) Dated June 19, 1856. (No. 1449.)

This process cannot be described without illustrations.

PITMAN, J. T. *A new method of using the electric current or currents for telegraphic and other purposes.* (A communication.) Dated June 20, 1856. (No. 1452.)

This consists in employing the positive and negative current through electro magnets, the poles of which are in juxta-position, the latter being rendered, by change of polarity, alternately mutually attractive and repellant, thus enabling the patentee to combine the local and relay magnets, or to use the combination simply as a relay with a considerable increase of power. It also comprises other features.

BULLOUGH, J. *Improvements in looms.* Dated June 20, 1856. (No. 1453.)

This relates to a patent dated 9th March, 1855, and consists in further improvements in the stop rods. It relates also to an arrangement of mechanism for regulating the tension of the yarn as the yarn beam decreases in diameter, and also to giving a self-acting motion for re-taking up the cloth after the letting-back motion has been in action.

HAGUE, J. *Improvements in machinery or apparatus for manufacturing bands or cords for driving machinery and other purposes.* Dated June 20, 1856. (No. 1455.)

In this machinery a series of strands or threads are twisted or twined together, and each of the strands or threads are kept at an equal tension as they are twisted, and wound on to bobbins.

CROFTON, M. T. *An apparatus for inking stamps used by bankers and others.* Dated June 20, 1856. (No. 1456.)

Inking rollers are so arranged and disposed as to distribute ink uniformly upon a dabber in the form of a roller, instead of a flat surface as heretofore commonly employed for inking such stamps.

DAVIES, G. *Improvements in apparatus for measuring and indicating the leakage of vessels.* (A communication.) Dated June 21, 1856. (No. 1461.)

The principal feature here, consists in giving motion to an index for showing the depth of water in the hold of a vessel, by the compression of air within a tube by the rising of the leakage water.

HANDCOCK, E. R. *Certain improvements in mechanism connected with engines to be worked by steam or other motive power.* Dated June 21, 1856. (No. 1462.)

The patentee describes certain mechanism for changing reciprocating into rotary motion, composed of racks and toothed wheels, &c., which cannot be well described without illustrations.

MINNE, C., and A. COLSON. *Improvements in making bread.* Dated June 21, 1856. (No. 1464.)

This invention cannot be described without illustrations.

MILLER, W. V. *Improvements in propelling vessels.* Dated June 23, 1856. (No. 1465.)

This is a mode of applying cylinders in the bottom of vessels, in which cylinders work freely from inboard, and act against the water.

LACROIX, J. C. L. *Filthing and shaving the merino, plain satin, and muslin of wool.* Dated June 23, 1856. (No. 1466.)

A drawing is connected to the specification of this invention, and letters of reference are placed upon the drawing, but no corresponding written description is given.

GURNEY, G. *Certain improvements for warming and moistening air.* Dated June 23, 1856. (No. 1468.)

A metallic vessel, having a number of plates extending from its outer surface, stands with the plates vertical in a shallow trough of water. Heat is communicated to the interior of the apparatus, and by conduction passes into the plates on the outside; part of this heat is then communicated to the water in the trough, and part to the air between the plates above.

LONGRIDGE, J. A. *Improvements in obtaining and applying motive power for the conveyance of minerals, pumping, and other purposes in mines in which motive power is*

required. Dated June 23, 1856. (No. 1470.)

This consists in the use of compressed air forced into suitable reservoirs, by means of a head of water acting on pumps or other apparatus suitable for the purpose.

RILEY, G. *An improved refrigerator for cooling brewers' and distillers' worts.* Dated June 23, 1856. (No. 1471.)

The worts are run through a great length of metal pipe laid in a continued spiral with many circumvolutions, with metallic divisions between each circle forming a continuous passage way, in which cold water runs in a contrary direction to the worts.

MILLER, J. *Improvements in furnaces for more effectually consuming the smoke, and economizing the fuel employed therein.* Dated June 23, 1856. (No. 1472.)

Two sets of metal plates are adapted to furnace doors disposed at opposite angles to each other in a skeleton door frame, for preventing radiation of heat outwards, and admitting air into the furnace.

VIVIAN, H. H., B. G. HERRMANN, and W. MORGAN. *Improvements in the manufacture of copper, and in obtaining gold and silver from the ores employed in such manufacture.* Dated June 23, 1856. (No. 1473.)

Claims—The reducing metallic bottoms or copper to the state of regulus, and roasting and smelting the same, so as to obtain metallic bottoms, in which the gold is concentrated, and is further concentrated by repeating the process, and by which process also a regulus of improved quality is obtained, which may be treated to separate silver. Also, producing a regulus from a metallic bottom or copper by converting the same into an oxide, and fusing such oxide with a sulphur compound.

ATKIN, I., and M. MILLER. *Improvements in machinery for sewing lace and other fabrics.* Dated June 23, 1856. (No. 1475.)

Two fluted or toothed rollers gearing together corrugate the fabric, and pass it in stitches on the needle, which is suitably formed. The invention comprises other parts.

MILLS, C. *An improvement in the hammer rails of pianofortes.* Dated June 23, 1856. (No. 1476.)

The wire or axis of the hammer butt is received by a metal plate with projections having grooves in their ends affixed to the edge of the hammer rail, and the wire or axis is held in position in the grooves by a similar metal plate (with projections) to that heretofore used. The two plates are fixed separately to the hammer rail, and at an angle to each other.

HARDON, E., and J. HENRY. *Improvements in looms for weaving, and in machinery for communicating motion to looms and other machines.* Dated June 24, 1856. (No 1477.)

This invention comprises several improvements which cannot well be described without illustrations.

TAYLOR, J. *An improved vessel for containing chemicals for the generation of disinfecting gases.* Dated June 24, 1856. (No. 1478.)

Above the mouth or orifice of a vertical vessel is fixed a cross-bar of wood (or other non-corrosive substance). The cover of the vessel, having attached to its under side a ring of vulcanized india-rubber, is fixed to a screw which works through a nut in the cross-bar, over the centre of the mouth. By the screw the cover may be made to compress the india-rubber ring, and effectually close the vessel.

SAXBY, J. *A mode of working simultaneously the points and signals of railways at junctions to prevent accidents.* Dated June 24, 1856. (No. 1479.)

The semaphore signals, the coloured glasses of the signal lamps, and the points, are all actuated by a single motion of a lever. The invention cannot be fully described without illustrations.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GEDGE, J. *An improved pump, reservoir, and apparatus for measuring liquids.* (A communication.) Dated June 17, 1856. (No. 1423.)

A closed reservoir is constructed into which the liquid is poured from a tank or holder; when filled, this is to be carried or wheeled to any part of the shop or warehouse. On this reservoir are two strainers, one for the oil measures, the other to receive the surplus oil. The pump is on the reservoir, and each stroke causes to issue an exact measure, say a pint or a quart.

JOHNSON, J. H. *Improvements in the treatment of sugar canes, and in the apparatus employed therein.* (A communication.) Dated June 17, 1856. (No. 1429.)

Sugar canes are distilled by a peculiar steam boiler apparatus whereby the whole of their saccharine properties are extracted to form a new alcoholic beverage.

BAYNTON, W. *Improvements in rolling rails for railways.* Dated June 17, 1856. (No. 1431.)

In rolling T rails, or rails the under side of which is flat, the rolls are arranged so that each time the rail is rolled flat the under side shall be brought to a concave form, the hollow being again filled when the rail is rolled on edge by the metal displaced from the throat of the rail.

DEPAI, A. *Improvements in brakes for*

railways. Dated June 17, 1856. (No. 1432.)

Brakes are so arranged that, at the will of the guard, skids or shoes may be brought under the wheels of each of the carriages.

NICKELS, C., and J. HOBSON. *An improvement in weaving when Jacquard or other ornamenting apparatus is employed.* Dated June 17, 1856. (No. 1433.)

To effect a more uniform delivery and tension of the warp threads or yarns from the bobbins, the unwinding is caused (by a suitable arrangement of parts) to take place in the opposite direction to that generally adopted; that is, the revolution of the bobbin is in the opposite direction to the delivery of the warp thread or yarn.

MILLS, W. *Improvements in pianofortes.* Dated June 19, 1856. (No. 1447.)

The bridge is glued or fixed to the back of the sound board, and by screws and springs fixed to the bracings the sound board is drawn towards the bracings. The pins fixed to the bridge pass through the sound board, and have notches formed in them, within which notches the strings pass, and, when tightened, they draw the bridge and sound board towards them.

MONCKTON, E. H. C. *Improvements in pianofortes.* Dated June 20, 1856. (No. 1451.)

This relates to the action, and consists in employing, in lieu of the buffing-leather, vulcanised india-rubber, preparations thereof, or india-rubber webbing, or similar fabrics, on the hammer heads, under-levers, &c.

SANDS, A. *Improvements in apparatus for signalling and for saving life and property at sea, part of which is applicable to signalling on land.* Dated June 20, 1856. (No. 1454.)

Illuminated letters or words are used for signalling between vessels at night, or on land. The letters are punched in plates, which are illuminated by lights. 2. Floats are constructed which may be thrown from vessels when necessary to communicate signals, or to act as preservers of life, mails, and property. To these floats are attached flags or signals that are kept above water by weights secured to the float at the opposite side; printed forms are also inserted in such floats.

PIGOTT, H. *Improvements in hats and other coverings for the head.* Dated June 20, 1856. (No. 1457.)

The lining of the hat is attached in the usual way to the hat near the brim, for the greater part of the way round, but the portion embracing the temples and forehead is disconnected from the hat body, which at this front part is double, or has an inner lining piece. A clear air space is left between, and both parts are perforated to admit of ventilation.

JONES, S. T., and J. HARRIS. *An amalgamating machine to extract gold and silver, and to separate iron from crushed mineral ores in water.* Dated June 20, 1856. (No. 1458.)

In a water-tight case, of which the bottom is semi-circular, are fans, one of them having two or more blades, each perforated with numerous holes. The other fan is placed above the lower, and is made of open bars. The feeder has an opening, through which the crushed mineral ore and water pass into the amalgamator, and the fans being revolved mix the whole up. Connected with the feeder is a series of magnets, to take up the iron that may be in the crushed mineral, to prevent its passage into the amalgamator.

HOWELL, J. B. *Improvements in the manufacture of cast-steel tyres.* Dated June 21, 1856. (No. 1459.)

Rings of cast-steel, or ring ingots cast by centrifugal force (or any other method) are submitted to rolling and annealing processes for the production of tyres, so as to free them from brittleness, and give strength to the metal.

VENTRE, E. *An improved carton or box for keeping papers or other articles.* Dated June 21, 1856. (No. 1460.)

The inventor constructs a box so as to admit of its being opened and the contents withdrawn, without displacing it, or any article resting upon it, by making the face of the box to open or shut by a button placed upon a spring and running in a slot; the pressure of the finger upon this button causes the face to fall, displaying the contents.

GILBEE, W. A. *Improvements in locomotion on railroads, part of which improvements are also applicable to ordinary roads.* (A communication.) Dated June 21, 1856. (No. 1463.)

The object here is to increase the adherence between the wheels and rails on railroads, and also to increase the speed of vehicles on common roads. 1. An extra wheel is applied in the middle of the axletree of the locomotive. 2. The crown of locomotive wheels is widened, and rails of hard wood are fitted close to the iron rails. That part of the crown which presses on the wooden rail has small sharp conical steel blades projecting.

JOHNSON, J., and W. BLACKWELL. *Certain improvements in self-acting mules for spinning.* Dated June 23, 1856. (No. 1467.)

In those self-acting mules in which a cam shaft is employed, the cam shaft is to be driven by gearing actuated by the twist shaft.

ROGER, R. *Improvements in machinery*

employed in the cultivation of land. Dated June 23, 1856. (No. 1469.)

A travelling windlass (actuated by the endless cord of Fisken's patent or other system of steam ploughing) has two drums, one winding on, while the other is winding off the rope. From a spur wheel attached to such drums, and driving them, power is taken by a pinion and chain wheel. At each end of the machine is a revolving cultivator in the form of a spiked roller, or digging wheel. One set is lowered when the machine is going in one direction, and then the other. The machine also has a chain of buckets and knives, a ladder, raising and lowering apparatus for cutting drains, and a sloping platform to deliver the soil so raised.

DYSON, G. *Improvements in the manufacture of iron.* Dated June 23, 1856. (No. 1474.)

In puddling and pig boiling rotary motion is to be given to the bottom of the furnace, or to that part of it which contains the melted metal. Tools are introduced and kept stationary, and agitate the melted metal.

DAVIES, D. *Improvements in wheel tyres.* Dated June 24, 1856. (No. 1480.)

An iron tyre, having flanges at the sides, is shrunk on to the fellies of the wheels as usual. A band of leather of sufficient thickness to fill up the space between the flanges of the tyre is fastened therein. A second wider band is then fastened round the former, securing them to each other and to the wheels by fastenings through the fellies.

HARRISON, J., and C. GELDERD. *Improvements in machines for warping and sizeing or otherwise preparing yarns or threads for weaving.* Dated June 24, 1856. (No. 1481.)

These improvements in beam warping machines relate—1. To mechanism for registering the length of yarn put on the beam, and stopping the machine when the required quantity has been wound on. A modification of the ordinary worm wheel in gear with a worm on the measuring roller is employed for this. 2. To those which have a self-acting backing off motion for winding the ends of broken threads, and the object is to leave the attendant at liberty, when the backing off strap is put on the first pulley, by providing arrangements which will push the strap on the loose pulley, and stop the backing off when the whole or part of the rods have descended. The improvements in sizeing machines relate —1. To a mode of putting friction on the beams to give the proper tension to the yarn going into the machine. 2. To tape sizeing machines, and consists in substituting for each of the drying cylinders used an apparatus formed by a fan revolved by belts from some convenient part of the machine, and by two discs arranged axially with the fan.

HARRISON, J., and C. GELDERD. *Improvements in looms for weaving.* Dated June 24, 1856. (No. 1482.)

This invention consists in arresting the reed alone, or in causing it, or one side of it, to remain stationary when the shuttle fails to box, while the slay, &c., move forward.

PROVISIONAL PROTECTIONS.

Dated December 17, 1856.

2993. Godwin Meade Pratt Swift, Viscount Carlingford, of Swiftseath, Kilkenny. An aërial chariot or apparatus for navigating the air.

Dated January 2, 1857.

17. John Wilson, of St. Helen's, Lancaster, manufacturing chemist. Improvements in the manufacture of steel.

Dated January 8, 1857.

64. Julius Goodman, Abraham Myers, and Louis Goodman, all of King David-lane, Shadwell, Middlesex. Improvements in the manufacture of caps or coverings for the head.

Dated January 21, 1857.

186. Henry Medlock, of Great Marlborough-street, Westminster, analytical chemist. An improved method of purifying water.

Dated January 26, 1857.

226. Adolphe Hensel, of Stafford place, Pimlico, gentleman. The manufacture of German yeast from flour.

Dated February 2, 1857.

303. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in heating the feed water of steam boilers. A communication from Messrs. Baudouin, Taniturier, and Richard.

Dated February 3, 1857.

311. Richard Laming, of Haward's-heath, Cuckfield, Sussex. Improvements in purifying gas, in obtaining materials useful for that purpose, and in working up into useful products certain ammoniacal and phosphatic substances obtainable as residues in the purifying of gas.

312. James Taylor, of Middlesborough-on-Tees, Yorkshire. Improvements in the governors for the engines of screw steamers, and other vessels propelled from the stern.

314. George White, of Laurence Pountney-lane, Cannon-street, city. Certain improvements in dyeing and printing textile fibres and fabrics. A communication from Mr. C. Lanth, of Mulhouse.

Dated February 4, 1857.

318. Andrew Steinmetz, barrister-at-law, of the Middle Temple, and Edith-villas, Northend, Fulham. A method, mode, contrivance, or management, to check the honesty of omnibus conductors and other receivers of money under similar circumstances, to be accounted for to their employers, without machine or mechanical appliance.

319. James Hamsher, of Elizabeth-street South, Pimlico, blacking manufacturer. Improvements in the manufacture of blacking for polishing, softening, and preserving boots and shoes, and other leathern articles.

320. Odoardo Gandini, of Newman-street, Oxford-street, major, lately in the Venetian army. An indicating target.

321. Edward Lewis and Gideon Böhm, of Coleman-street, London, lithographers. Improvements in printing in colours, called an improved photo-galvanographic chromographic process.

323. Saul Hart, of Portland-street, Liverpool. Improvements in apparatus for raising and forcing water.

324. Charles De Bergue, of Dowgate-hill, London, engineer. Improvements in the method of, or apparatus for, laying the permanent way of railways.

325. William Edward Newton, of Chancery-lane, civil engineer. Improvements in pianofortes. A communication.

326. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. An improvement in machinery for polishing flat surfaces of glass and other substances. A communication.

327. James Burrows, of Wigan, Lancaster, engineer. Certain improvements in steam engines.

328. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in the treatment of flax and similar textile materials. A communication from J. Lefebure, of Brussels.

329. Robert Holmes Houston, of Greenock, Renfrew, N.B., manufacturer. Improvements in effecting general conveyance or transport on water.

Dated February 5, 1857.

330. Thomas Summers, of Northam Iron Works, Southampton, engineer. Improvements in gauges for indicating pressure and vacuum.

331. Philipp Schäfer and Frederick Schäfer, both of Brewer-street, manufacturers. Improvements in travelling bags or cases, and an apparatus for carrying fittings therein.

332. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. An improvement in casting metallic articles. A communication.

333. Clarance Brazil and William Nicholas Crummack, of Chorley, Lancaster, manufacturers. Improvements in looms for weaving.

334. Henry Smith, of Stamford, Lincoln, agricultural implement maker. Improvements in haymaking machinery.

335. William Edward Newton, of Chancery-lane, civil engineer. Certain improvements in breech loading fire-arms. A communication.

336. George Chowen, of James-street, Covent-garden. Preventing further casualties on the Goodwin Sands.

Dated February 6, 1857.

337. Thomas Stott, of Sabden, near Whalley, Lancaster, mechanic. Improvements in pickers.

339. William Green, of Pembroke-cottages, Caledonian-road, Islington. Improvements in manufacturing or procuring substitutes for leather for boots, shoes, and other uses, and in machinery or apparatus for effecting the same.

340. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in preparing or dressing threads and other fibrous materials and in the machinery employed therein. A communication from E. C. T. Croutelle.

341. James Gilroy, of Auldhousefield, near Pollockshaws, Renfrew, bleacher. Improvements in applying starch or other semifluid matter by machinery to woven fabrics.

342. John Mayo Worrall, of Salford, Lancaster, dyer and finisher. An improvement in finishing a certain description of fustians called "diagonals."

343. George Wright, of Sheffield, stove grate manufacturer. Improvements in stove grates or fire places.

344. Thomas Newton, of Walsall, Stafford, manufacturer of saddlery. Improvements in the construction of stockmen's saddles and appendages thereto. Partly a communication.

345. Antoine Dècle and François Alexandre Drault, of Paris, jewellers. Improvements in the manufacture of bracelets.

346. Pierre Poisson, of Paris, artist. Improvements in preparing and applying surfaces for painting.

Dated February 7, 1857.

347. Henry Heald, of Sabden Whalley, Lancaster, cotton manufacturer, and Arthur Heald, of the same place, manager. Improvements in looms, and in pickers used for weaving.

348. Nicholas Nomico, of Manchester, and George Heyes, of Bury. Improvements in looms.

349. John Alfred Kimbert, engineer, Royal Navy. Improvements in marine steam engines.

350. John Coope Haddan, of Cannon-row, Westminster, civil engineer. Improvements in marine steam engines. A communication.

351. Charles Crickmay, of Guildford-place, Lower Kennington-lane, London, gun manufacturer. Certain improvements in breech loading guns or pistols for military and other purposes, and which said improvements are applicable, and will admit of being applied, to guns or pistols now in use.

352. Francis Wrigley, of Manchester, engineer. An improved apparatus for cutting tobacco.

353. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in casting metals. A communication from Messrs. Jackson Brothers, Petin Gaudet, and Company, of Rivé de Gier, France.

354. Joseph Nicolas Victor Cadiat, of Paris, engineer in the Imperial Navy. The application of centrifugal force in purifying minerals, or any other similar hard substances, by washing.

355. Joseph Skertchly, of Culford-road, De Beauvoir-square, engineer. Improvements in, and in the manufacture of saggers.

356. William Greenslade, of Bristol, brush-maker, and James Wood, of St. Pancras, Middlesex, working brush-maker. Certain improvements in brushes, especially applicable to painters' brushes.

357. James Taylor, of Upper-street, Islington, Middlesex, chemist, and Edward Owen, of Aberdeen-terrace, Blackheath, Kent, chemist. Improvements in the manufacture of yellow prussiate of potass.

358. Felix Lieven Bauwens, of Ranelagh-road, Middlesex, manager of Bauwen's Patent Candle Company. An improved mode of treating and distilling fatty matters, and in the apparatus employed therein.

359. Thomas Brown, of Ebbw Vale, Monmouth, ironmaster, and George Parry, of the same place, furnace-manager. Improvements in the manufacture of iron.

360. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. An improved method of obtaining motive power. A communication from G. Russo.

361. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. Improvements in measuring the capacity and contents of casks and other similar vessels, and in instruments or apparatus employed therein. A communication.

362. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in lamps adapted for burning resin-oil. A communication from D. Fehrman and F. Benkler.

363. William Hirst, of Bath. Improvements in manufacturing felted fabrics.

364. William Wilkens, manufacturer, of Baltimore, U. S. A. An improved cannon, which he calls a revolving battery. A communication from E. Ames, of Baltimore, U. S.

365. Perceval Moses Parsons, of Duke-street, Adelphi, civil engineer. Improvements in the permanent way of railways.

Dated February 9, 1857.

366. James Murdoch, of Staple-inn. An im-

provement in the process of treating the threads of floss silk, which is also applicable to the threads of other fibrous materials. A communication from G. Armand, of Lyons.

367. James Taylor, of the Britannia Works, Birkenhead, Chester, engineer. Improvements in machinery for crushing various substances.

368. Henry Cartwright, of the Dean Broseley, Shropshire. Improvements in the application and mode of working excentrics on steam engines.

369. Charles Turner, of Liverpool, hat-manufacturer, and Louis Watermann, of the same place, cap-manufacturer. Improvements in or applicable to the class of hats made from straw, grass, palm-leaf, or other like materials.

370. Léon Talabot, of Chaussée d'Antin, Paris, gentleman. Improvements in the manufacture of iron and steel.

371. Joseph Fenn, of Newgate-street, London, tool-manufacturer. An improvement in oil-cans and other like vessels. A communication.

372. David Falconer Wright, of Paisley. Improvements in the mechanical arrangement for raising and forcing of water or other fluid, air, or gases.

373. John Harding, of Beeston Manor Iron-works, Leeds. Improvements in the treatment of metallic ores.

374. Thomas John Taylor, of Sekforde-street, Clerkenwell, jewel-case maker. An improved construction of stereoscope.

375. Samuel Groves, of Judd-place East, Middlesex, organ-builder. Improvements in organs.

376. Henry Willis, of Manchester-street, Gray's-inn-road, organ-builder. Improvements in organs.

Dated February 10, 1857.

377. William Thomas Walker, of King-square, St. Luke, civil engineer. Improvements in apparatus used in gas-works for exhausting, forcing, transmitting, and regulating the flow of gas, and cleansing and warming gas-apparatus.

378. Abel Stokes, of Birmingham, manufacturer. New or improved machinery to be used in the manufacture of nails, pins, screws, and other similar articles.

379. Julian Bernard, of the Albany, Piccadilly, gentleman. Improvements in the manufacture or production of boots and shoes, or coverings for the feet, and in the machinery or apparatus employed in such manufacture.

380. Daniel Benjamin Herts, of Bunhill-row, Middlesex, merchant. Improvements in apparatus for stamping and embossing. A communication.

381. Benjamin Webster Owrid, of Dundalk, Louth, engineer. Improved method of connecting and disconnecting pipes or tubes.

382. Joseph Graham and James Shepherd, both of Burnley, Lancaster, machine-makers, and Thomas Whitaker, of Accrington, in the same county, manufacturer. Certain improvements in power-looms for weaving.

383. Jabez Morgan, iron wire drawer, of Kidderminster, Worcester. Certain improvements in the manufacture of steel and iron wire for umbrella and parasol-frames.

384. William Richelieu Hodges, of Manchester, merchant. Improvements in the manufacture of an elastic material, and of its application to certain purposes.

385. Austin Chambers, of Canterbury, and William Harrison Champion, of Lynsted, Kent. A mode of working railway-breaks.

386. George Bedson, of Manchester, manager. Improvements in coating metal with metal and metallic compounds.

387. August Frederick William Partz, of New York, U. S. A. An improved method of evaporating fluids, condensing and absorbing vapours, gases, and fumes, arresting and precipitating flocculent, metallic, or other particles, and transferring heat from air or steam to fluids and pulverulent substances.

388. Thomas Fielding Johnson, of Leicester, spinner, and John Williams, of Leicester, mechanic. Improvements in screw-gill machinery for preparing wool and other fibrous materials.

389. John Forrest Watson, of St. John's-square, Clerkenwell, Improvements in the construction of watches.

390. Jesse Bridgwood, of Burslem, Staffordshire Potteries. Improvements in connecting pipes to the basins of water-closets and wash-hand basins, and also in the means of stopping the outlets of wash-hand basins.

391. William Wood Pilcher, of St. Margaret's-at-Cliffe, Dover. Improvements in straw-shakers of thrashing-machines.

392. Abraham Royds, Carder, and John Kenyon, overlooker, both of Rochdale, Lancaster. Certain improvements or a certain improvement in machines for spinning or doubling, commonly known as throstles.

393. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improvement in or addition to the locks of fire-arms. A communication from J. B. Longa.

394. Thomas Howard, of King and Queen Iron Works, Rotherhithe, engineer. Improvements in the construction of cranked shafts or axles.

395. Henry Heald, of Sabden Whalley, Lancaster, cotton manufacturer, and Arthur Heald, of the same place, manager. Improvements in pickers and picker checks employed in weaving.

396. Henry Tibbets Ropes, of Liverpool, ice merchant, and David Wilson Thomas, of the same place, brass founder. Improvements in the application of filters to cocks, taps, or other valves used to draw off liquids. A communication.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," February* 24*th*, 1857.)

2395. B. Kisch. An apparatus for containing an arrangement of cards or papers for selection. A communication.

2405. T. Allen. An improvement in the manufacture of iron and other metallic bedsteads.

2406. G. Guillaume. An apparatus for obtaining motive power by means of water or other fluid.

2418. C. N. Wilcox. Improvements in the preparation and application of certain vegetable matters to be used in toilette soaps, pomades, and other like perfumery.

2419. E. Tombs. An improvement in screw-propelling.

2420. J. Commandeur. A mechanical apparatus for regenerating the impulsive force of any motive power.

2421. F. Foggi. Improvements in the manufacture of engines driven by steam or other vapour.

2433. T. F. Henley. The employment of certain substances not hitherto made use of for the production of alcoholic spirits, and for the manufacturing of the same, the refuse material being applicable as a food for cattle.

2436. J. Smith. Improvements in heating the feed-water of steam boilers for marine and land purposes.

2441. T. Lawes. An improved construction of agricultural implement to be used in tilling the land.

2450. J. Harrison. Improvements in machinery for warping yarns, part of which improvements are also applicable to creels used for other purposes.

2460. A. Lorimier. An improvement in reworking vulcanized India-rubber.

2464. C. Briqueler, fils. The purification, clarification, and discoloration of the cotton-seed oil.

2468. P. A. L. de Fontainemoreau. An improved knitting-loom. A communication.

2487. J. C. Bremer. Improvements in propellers.

2489. N. Brough. Improvements in dress fastenings.

2499. R. A. Brooman. An improved oil for burning in lamps, and an improved burner and chimney. A communication.

2523. M. Dognin. Improvements in machinery for making lace or net.

2528. J. L. Marie. Improvements in raising, propelling, and forcing water and other fluids, and in obtaining motive power.

2548. D. H. Whittemore. An improved machine for paring, slicing, and coring fruit or vegetables.

2572. J. Stone. Improvements in the construction of force-pumps.

2587. W. Gray and J. Tate. Improvements in apparatus for washing.

2600. H. Keeling. An improvement in rivetting fish-joints and other parts of the permanent way of railways.

2625. L. J. V. Vuitton. An improved apparatus for consuming smoke.

2642. F. J. Manceaux and E. N. Vieillard. An improvement in breech-loading fire-arms and ordnance.

2672. J. H. Johnson. Improvements in machinery or apparatus for cutting and folding paper. A communication.

2709. J. Drew. Improvements in library tables or desks.

2799. J. Musgrave, jun. Improvements in the construction of cloth beams for beetles.

2893. W. Hooper, J. Fry, and G. Nasmyth. Improvements in springs for railway carriages and for other purposes.

2898. J. Longbottom. Improvements in generating, surcharging, or superheating steam.

5. E. T. Noualhier and J. B. Prévost. Improvements in applying metals over hard, vitrified, or any other surfaces by galvanoplastic process.

43. J. M. Hyde. Improvements in iron and wooden ships or vessels, and in the adaptation of the machinery for propelling the same.

64. J. Goodman, A. Myers, and L. Goodman. Improvements in the manufacture of caps or coverings for the head.

133. T. J. M. Townsend. Improvements in drain-pipes, and in machinery for producing the same.

142. C. F. Vasserot. Covering all descriptions of grain with a fertile substance or manure, and the apparatus employed for the same. A communication.

148. R. Reeves and J. Reeves. Improvements in machinery for delivering manure for agricultural purposes.

213. T. Ayles and R. A. Ayles, jun. Improvements in the construction of ships and other vessels navigating on water.

221. H. Bessemer. Improvements in the manufacture of iron and steel.

311. R. Laming. Improvements in purifying gas, in obtaining materials useful for that purpose, and in working up into useful products certain ammoniacal and phosphatic substances obtainable as residues in the purifying of gas.

329. R. H. Houston. Improvements in effecting general conveyance or transport on water.

334. H. Smith. Improvements in haymaking-machinery.

346. P. Poisson. Improvements in preparing and applying surfaces for painting.

353. J. H. Johnson. Improvements in casting metals. A communication.

364. W. Wilkens. An improved cannon, which he calls a revolving battery. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1854.

394. Bashley Britten.
396. Nicholas Riggenbach.
401. John Chisholm.
403. Harvey Hilliard.
405. William Milner.
407. John Urie.
408. John Ramsbottom.
416. Ernest Gessner.
431. James Boydell.
432. Thomas Settle and Peter Cooper.
436. Charles Walker.
457. Auguste Edouard Loradoux Bellford.
544. William Clay.

PATENT ON WHICH THE SEVENTH YEAR'S STAMP DUTY HAS BEEN PAID.

1853.

2497. John Johnson.

LIST OF SEALED PATENTS.

Sealed February 17, 1857.

2919. John Robinson Scartliff.
3000. Joseph Bower.

Sealed February 20, 1857.

1959. Thomas John Chipp and Richard Bitmead.
1966. Edward Hallen.
1969. William Racster.
1971. Alexander Moses.
1983. John Perry.
1984. William Henry Perkin.
1990. Edmund Simpson.
1992. Alfred Vincent Newton.
1999. Alfred Vincent Newton.
2003. Charles Durand Gardissal.
2014. John Fletcher and William Fletcher.
2024. Manoah Bower, Richard Peyton, and Joses Weaver Downing.
2026. Matthias Edward Bowra.
2037. James Apperly.
2048. Jules Mosard.
2057. William Keates.
2058. George Anderson.
2060. William Moberly.
2065. Henry Edward Cradock Monckton and William Clark.
2068. William Smith Mitchell and Charles Martin Ernest Gärtner.
2081. Charles Louis Lapito.
2101. Richard Archibald Brooman.
2144. Richard Peyton.
2373. Jean Alexandre Labat, jun.
2558. Benjamin Goodfellow.
2906. John Aston and John Brant.
3022. William Mill.
3030. James Redgate, Edwin Ellis, and John Cropper.

Sealed February 24, 1857.

1982. George Warriner.
1985. William Frederick Bush and William Hewitt.
2004. Charles Durand Gardissal.
2040. Joseph Lamb.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
Jan. 30	3940	I. Parkes	Birmingham	Life protector.
,,	3941	Price's Candle Company	Vauxhall	Omnibus lamp.
Feb. 4	3942	H. R. Cooksly	Birmingham	Fastening for coffins, &c.
14	3943	J. J. Welch & J. S. Margetson	Cheapside	West-end collar.
16	3944	W. Allender and J. H. Allender	Liverpool	Air conductor hat.
17	3945	W. G. Shaw	Kingsland	Signalizer.
21	3946	Whicker and Blaise	St. James's-street	Fumigating apparatus.
,,	3947	Whicker and Blaise	St. James's-street	Syringe.
23	3948	J. E. Killick	Ludgate-hill	Waistcoat shirt.

PROVISIONAL REGISTRATIONS.

Jan. 31	843	P. Astley	St. John-street-road	Gas flat iron.
Feb. 4	844	P. Astley	St. John-street-road	Double fronted shirt.
5	845	F. Wickstead	St. Martin's-lane	Detached elliptic spring.
13	846	G. Fellows	Birmingham	Metallic fence.
,,	847	T. Howard	Sheffield	Register stove.
17	848	J. Hedges	Marylebone	Retinaculum front.
18	849	C. Watts	Harrow-road	Dress suspender.
23	850	T. Howard	Sheffield	Register stove.

NOTICES TO CORRESPONDENTS.

We hope to find space in our next number for a portion, at least, of several letters that have been standing over for some time.

The letter of "A Late Secretary" on the Royal Cornwall Polytechnic Society shall also, if possible, appear in our next.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

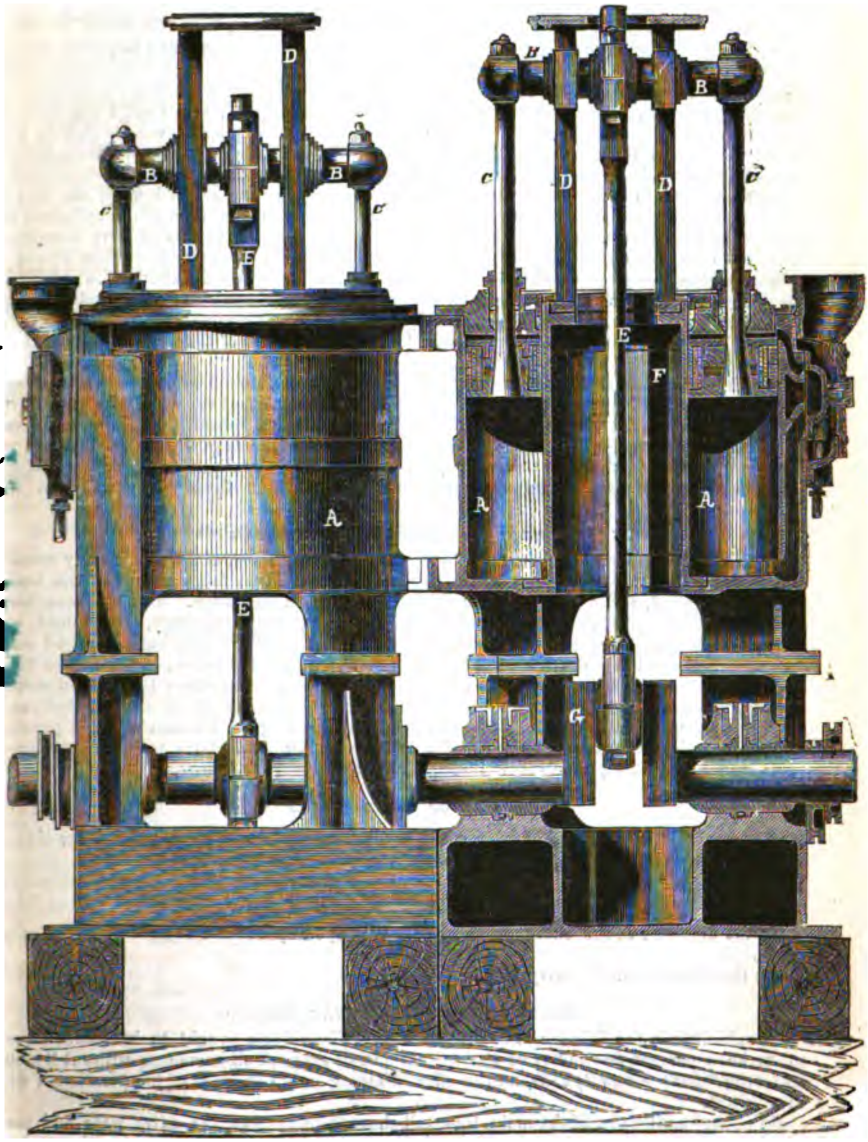
Mechanics' Magazine.

No. 1752.] SATURDAY, MARCH 7, 1857. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

MAUDSLAY'S IMPROVED ENGINES FOR SCREW PROPULSION.

FRONT ELEVATION.



(For Description, see No. 1751, page 194.)

INSTITUTION OF CIVIL ENGINEERS,

February 24th, 1857.

THE Paper read, was ON CHAIN CABLE and TIMBER TESTING MACHINES.

BY MR. T. DUNN, ASSOC. INST. C. E.

The hydraulic press machines, for testing chain cables had been generally so costly in construction, and required such expensive foundations, that few of the chain manufacturers had on their premises any means of testing their chains. Messrs. Dunn, Hattersley, and Co., of the Windsor Bridge Iron Works, Manchester, having had their attention directed to this want, designed the simplified testing machine, the description of which formed the subject of the paper, and which could be produced for £200 to £300, instead of £1,100 to £1,600, the cost of the Government and Corporation testing machines. The bed of the new machine consisted of a trough of cast iron, with a slot throughout its length (30 yards), to contain the portion of cable under proof; this trough was laid on guntrees of wood as a foundation, and a few cross bars were placed over the slot, to prevent the end of the chain from rising in case of fracture. This arrangement precluded the possibility of accident to the workmen when testing chains, as the ends were retained within the trough instead of sweeping across laterally, as frequently occurred when the chains were laid upon a bench for testing. The arrangements for the main hydraulic cylinder, the valves, and the levers, were very simple and effective, and the results of very numerous series of experiments, which were given, demonstrated the power and uniform action of these machines—one of which was used at the Paris Universal Exhibition, in 1855, for making a long series of experiments on the strengths of colonial and other timber, under the direction of Capt. Fowke, R.E., part of whose report was quoted.

The Paper was illustrated by numerous drawings, and some of the links broken in testing were exhibited.

In the course of the discussion it was remarked, that the broken links showed, in almost every instance, that the fractures had arisen from an imperfect union of the iron of the links in welding. It was considered that sufficient force and rapidity of blows could not be obtained by hand labour, and that tilt hammers with the requisite speed had not yet been employed; neither had steam hammers, which were merely lifted by steam and fell by their own gravity, sufficient speed for heavy chain making. A description was given of

NAYLOR'S SINGLE OR DOUBLE-ACTING STEAM HAMMER,

Which could be changed at pleasure, by merely moving a lever, and by which any amount of steam, from a mere breathing upon the piston, to that of the full pressure of the boiler could be applied, and be varied whilst the hammer was in full work. Two of these hammers were employed in the workshops of the Eastern Counties Railway, at Stratford, and one at Norwich. They were somewhat like the "Nasmyth" hammer, but comprised several modifications having reference particularly to the valves and valve gearing. The hammers weighed 10 cwt. each, and when worked with a length of stroke of 12 ins., and double acting, 250 blows per minute could be obtained, or more than twice the number that could be given by an ordinary hammer lifted by steam, and falling by its own unaided gravity. The same principle was said to be applicable for rivetting iron plates for ship building—also for boilers, tanks, wrought iron bridges, rivet making, &c.

SIZE OF CHAIN CABLE.

Some calculations which had been made to discover the law which regulated the size of the chain cable and the weight of anchor for a given ship, showed that

$$\tfrac{1}{2}\sqrt[3]{\text{Load displacement}}$$

gave the diameter of the chain cable usually employed by screw-steamers of the present form.

At the Meeting of February 10th, a Model of

HURRY'S IMPROVED RAILWAY CROSSING

Was exhibited in the Library after the Meeting. The objects sought to be attained were to make a perfect continuity of the main line rail through all crossings, without "point and wing" (or "elbow") rails, and to effect a saving in the expense of the permanent way of railways.

By perfect continuity of the main line rail through crossings, the extra wear and tear which at present took place at crossings, both to the permanent way, and to the rolling

stock, was prevented, and the danger of wheels getting off the rail, or on to the wrong rail, particularly in "elbow" crossings, was removed. The steeled "point and wing and elbow" rails used in the construction of crossings, parts involving considerable wear and expense, were removed.

In this improvement, where a main line was crossed, the rail crossing, in approaching the point of crossing, was raised to about 1¼ ins. above the level of the main line rail. The crossing rail, both inside and outside the main line rail, was cut at such a distance as to allow of the free passage of wheels upon the main line, and both ends of the rail were bent down for about one foot, so that the extreme points were on the same level as the main line rail. Between the end of the rail and the outside of the main line rail was laid a packing at the same level as the main line, and in the line that the flanges of wheels traversing the crossing would take, of a sufficient width to allow for deviations of gauge. Between the inside of the main line and the end of the crossing rail was placed a movable packing, or wedge, which rested upon inclines in such a way that it might be raised to the level of the main line, or lowered sufficiently to allow the flanges of wheels upon the main line to clear. This movement was produced by the action that reversed the points leading to the crossing. By these means a level and continuous way was made for wheels to pass along (upon their flanges) for the distance between the ends of the cut rails of the crossing line. The gauge was maintained by a check rail.

In the crossing of a siding with a siding rail, the movable packing was not required, as it was not necessary to keep the continuity of either rail. In this case both rails were cast in the same way as the crossing rail before described, and they were laid on the same level, their ends being bent down as described, to the level of a packing laid 1¼ ins. below their general level, and so placed as to carry wheels when traversing either line, over the distance between the rails, the gauge being kept by check rails.

ON THE NATURE AND EFFECTS OF DEPOSITS IN BOILERS.

As opinion is much divided upon the nature and effects of steam boiler deposits, and as the subject is one of great importance, we have much pleasure in publishing the following report of an analysis made by Dr. Edwards, of Liverpool, for Mr. C. Wye Williams to test the heat-conducting power of such deposit. This is the first instance in which we have known boiler incrustations to be formally analysed.

ANALYSIS.

Royal Institution Laboratory,
Liverpool, 26th Feb., 1857.

Analysis of crystalline deposit from boilers; very hard; whitish brown colour; crystallized in repeated layers of small prisms; inner surface (in contact with the water) rough and nodular; specific gravity, 2·82, at 60° Fahr.,

CONTAINS,

Sulphate of lime	78·00
Water of crystallizing action	14·00
Sulphate of magnesia	3·20
Sulphate of potassa	1·60
Silica	2·20
Organic matter and traces of chlorides	1·00
	100·00

The above analysis shows that the crystalline deposit consists chiefly of dihydrated sulphate of lime crystallized in prisms. The other salts appear to me to be deposited between each act of crystallization, which forms a layer of the saline constituents of the water adherent to the primary crystals of the sulphate of lime, and may thus be regarded as impurity, and of secondary importance; the definite crystallization of the gypsum would doubtless operate greatly in increasing its power as a conductor of heat.

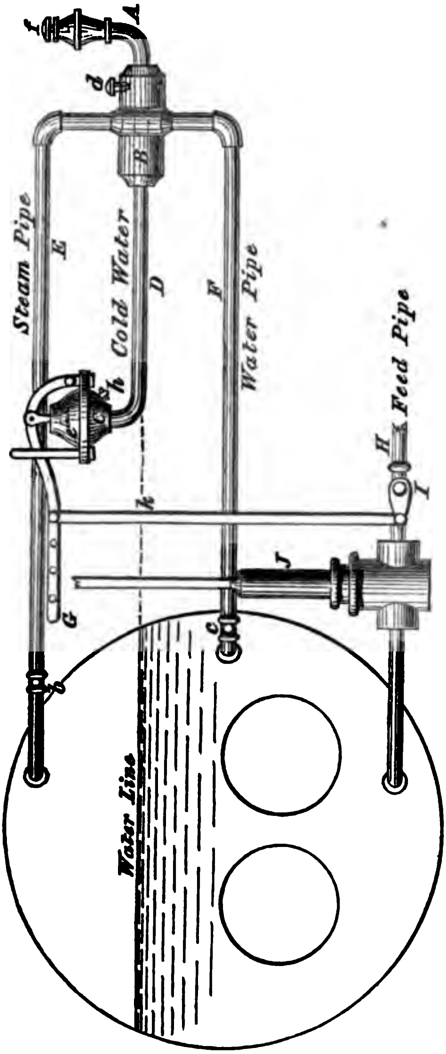
With reference to the conducting power of this deposit, I experimented with a vessel, the bottom of which was formed of the same, half an inch thick. I found the heat passed rapidly through the material, and that the highest temperature attained by the outer surface during a continued boiling was 240° Fahr. Such a temperature cannot injure the iron boiler plates, and it seems to me that this species of incrustation is a sufficiently good conductor of heat to prevent the iron becoming injuriously heated.

J. Baker Edwards, Ph. D., F.C.S.

Lecturer on Chemistry and Medical Jurisprudence, Royal Infirmary, and Royal Institution, Liverpool.

To C. W. Williams, Esq.,
Managing Director of
The Dublin Steam Company.

LAPHAM'S WATER-REGULATOR FOR BOILERS.



A very simple, and apparently efficacious, self-acting apparatus for regulating the water-level in steam boilers, is now under the notice of engineers. It is, we believe, the invention of an American gentleman, and brought forward in this country under the agency of Mr. T. H. Robinson, of Buckingham-street, Strand, London. A working model of the apparatus was exhibited on Tuesday at the Institution of Civil Engineers. It consists of a pipe and cylinder in communication, situated at the proper level of the water in the boiler, which is kept filled with cold water. Two pipes proceed to this cylinder, the one from the steam portion of the boiler, and the other from the water space. When the water falls below the proper level, steam passes through the lower or water pipe, and expanding the water in the cylinder and pipe, causes an expansive action against an India-rubber diaphragm, to which is attached a lever, acting by cranks and levers upon the valve in the feed-pipe.

The accompanying engraving will illustrate its construction more fully. The following are the directions issued for its use:

"Unscrew air-plug *h* in cup-shaped cylinder *C*, and also water-plug *f*, from which fill pipe *A D* with cold water, which will fill *C* until it reaches India-rubber diaphragm or piston *e*: screw up *h* tight, and fill with water until it overflows at plug *f*; then, with red lead or otherwise, make *f* air-tight. *This is a permanent arrangement.* Open stop-cocks *b* and *c* in steam and water pipes *E* and *F*; unscrew air-plug *d* in cylinder *B* until steam begins to blow off; then screw down tight.—*This must be done every morning.* The water in cylinder *B* or pipe *F* will then be at the same level as in the boiler, but at cylinder *B* will be nearly cold, having no effect on the water in pipe *A D*; but, as the water in the boiler falls below cylinder *B*, it will necessarily fill with steam, and, by heating and expanding the water in pipe *A D*, will raise piston *e*, and consequently lever *G*, which will open stop-cock *I*; admitting water from feed-pipe *H* to pump *J*, raising water in boiler to its proper level, filling *B* with water which will cool water in *A D*; the pressure of the atmosphere will then force back piston *e* and lever *G* to their proper level.—*This action will be continuous, unless the machine is damaged by accident or otherwise.*"

An apparatus in action may be seen at Mr. Cater's, Grove Boiler Works, Great Guildford-street, near Union-street, Borough, London.

FURTHER IMPROVEMENTS IN THE MANUFACTURE OF IRON AND STEEL, BY MR. BESSEMER.

Mr. H. Bessemer, who has at least the merit of being indefatigable in his efforts to improve the iron manufacture, has just filed specifications of two patents for further improvements therein. The process of puddling iron in Great Britain is generally carried on in furnaces which reverberate the flame and gaseous matters evolved by the combustion of mineral coal on to the fluid or semi-fluid metal, "whereby," says Mr. Bessemer, "the iron is found to be more or less injured by the gaseous matters thus brought in contact with it, while the consumption of coal adds greatly to the cost of the process." The object of the first of his new inventions is to render malleable either the crude molten iron obtained from the smelting furnace, or remelted pig or refined iron, in part by the process of puddling (or by a process producing a similar effect) and in part by forcing into and among the particles of such fluid iron jets of air, or of some other gaseous matter containing sufficient oxygen to raise the temperature of the metal, so far as to admit of the puddling or other analogous process being carried on without the use of any fuel, or any other heat than is obtained by the introduction of oxygen or hydrogen into the metal. In carrying this invention into practical operation, he prefers to use an iron vessel lined with fire bricks (or other refractory substance) and to close over this vessel, so as to prevent, as far as possible, the loss of heat. Apertures must, however, be left for the escape of gaseous matters conducted into, or evolved by, the metal during the process. Into the lower part of the vessel he inserts tuyeres or jet pipes of fire clay or of iron, protected by the passage of water through them, as already practised in making tuyeres. Through these tuyeres he forces the aforesaid gaseous matters, either alone or in combination with solid substances capable of evolving oxygen, which substances, being first reduced to powder, may be carried by the currents of gaseous matter into the fluid metal. He also puts into the vessel some of the fused oxide of iron, or scoria formed during the preceding operation, in the same vessel, which is to assist in the decarbonization of the crude metal. Hydrogen gas, or any matter capable of evolving hydrogen may also be used, either alone or in combination with other gaseous matter containing oxygen, for the purpose of combining with the sulphur contained in the crude metal, or for adding to its temperature. "By these means," says Mr. Bessemer, "the fluid crude iron may be decarbonized and rendered malleable, or the process may be discontinued at an earlier stage of the process, and before the malleable condition is obtained." In either case, he prefers to run the charge of metal so treated into another vessel of iron, lined with fire brick. This vessel may be heated previous to the commencement of the process, by passing the waste heat of the converting vessel into it; or the waste heat may be applied throughout the puddling or other analogous process. In this last vessel, the metal may be stirred about, until it passes from the fluid to the pasty or solid condition, and is broken or divided into small fragments, the fluid scoria obtained in the first operation, diffusing itself throughout the mass, and thereby assisting in the decarbonization of the metal, and in rendering the disjointed mass suitable for the after process to which it is subjected.

The second of his new inventions consists in obtaining crude or grey pig iron, hard white iron, or steel, and malleable iron, direct from carbonaceous iron ores, or from any mixtures of carbonaceous ores with oxides or other ores of iron, by the application thereto of a blast of hot or cold air, or steam, or of any other gaseous matter containing oxygen or hydrogen, and without requiring any fuel except such as is evolved from the said ores of iron, and from the gaseous matters forced in. This invention may be carried into practical operation in several forms of furnaces or apparatus. It will, however, be found that a vessel or furnace similar in form to the generality of blast furnaces is well suited for the purpose. Mr. Bessemer, however, prefers that the furnace should be of smaller dimensions than usual. The iron ore (either raw or previously roasted) is to be put from time to time into the upper part of the furnace, the blast of air or other gaseous matter being forced through tuyeres situated below the surface of the fluid metal; or the blast may be in part directed among the pieces of ore, at a level above the surface of the molten metal, so that the heat generated by the combustion of the carbon contained in the fluid metal below, and also in part by the combustion of a portion of the iron itself, may pass upward and act upon the upper part of the charge of ore, and gradually melt it down, the slags being allowed to pass out of the furnace above the fluid metal, the discharge hole for the metal being situated below that through which the slags or scoria escape.

MR. MALLET'S WORK ON "THE CONSTRUCTION OF ARTILLERY."

To the Editor of the Mechanics' Magazine.

SIR,—I have to return you thanks for bringing the controversy between me and the "Civil Engineer" to a short issue, which may be decided by a simple experiment, and I willingly accept your invitation to "extend my consideration to the case where mutual normal action takes place," at which you state that I stopped short.

But first I must remove a few *apparent* differences between your statement and mine, for I believe that in reality we are perfectly agreed.

First. You are aware that I had already acknowledged my error about external pressure, on a *simple* cylinder, before it was published, though too late for correction. I willingly submit to any amount of castigation for this stupid carelessness, but I may be permitted to remark, that this error does not affect any of my previous statements, and that it is the only one of which I expect to be convicted.

Secondly. I must remind you that the disappearance of k and k' from my equations resulted from the supposition that they are equal, and that when this is not true the equations are changed accordingly; and I will presently show that the exact values of these coefficients (or of e and E, if they are more accurate) are essential to the *practical* result.

Thirdly. The *eight* equations at the disposal of the "Civil Engineer" for determining *seven* unknown quantities, according to his theory, are the following:

$$l = \text{constant (1)}. \quad \lambda = \text{constant (2)}.$$

$$\lambda + \nu + \tau = c \text{ (3)}. \quad l = e\lambda + \mathrm{E}c \text{ (4)}.$$

$$n = e\nu + \mathrm{E}c \text{ (5)}. \quad t = e\tau + \mathrm{E}c \text{ (6)}.$$

$$\frac{d(n\rho)}{d\rho} = t \text{ (7)}. \quad \Delta\nu = \Delta\frac{d(\tau\rho)}{d\rho} \text{ (8)}.$$

Where ρ is the radius and $d\rho$ the thickness of the elementary cylinder.

Equation (7) is the one which I described as that "supplied by the known values of n at the inner and outer surfaces," because I counted it safer, when I quoted from memory, to give this general statement of the way in which the equation was found than to write it down (as I have now done) in a form that may perhaps differ from his; but I did not, as you supposed, count this as one equation and its integral as another; I counted it altogether as one equation, not two.

Equation (8), I in like manner described as the condition of continuity; it is one of the most obvious of all, signifying that the compression of each elementary cylinder is equal to the difference between the extensions of its inner and outer radii; but I believe that the "Civil Engineer" did not take much account of it.

For the way in which he used these equations, I still quote from memory, but I have now the advantage of your assistance; you allow "that the assumptions that λ and l are invariable seem very arbitrary, and you cannot admit much force in the demonstration that is attempted in order to establish their validity, and it is by the aid of these equations, and not by the equation of continuity that e and E are eliminated and the equation $n + t = \mathrm{C}$ results;" that is to say, instead of the differential equation (8), which is *necessarily* true, and of which the integral depends on the initial values of ν and τ, he adopts the definite equation (2), which *happens* to be true when ν and τ were originally constant, but which has not the power (like a differential equation) of accommodating itself to any other initial condition, such as that of Mr. Mallet's gun, to which the "Civil Engineer" insists on applying it. And now, with great respect, I must say that these are not "frivolous and ill-founded objections," but errors fully as grave as mine of last week, and nearly as bad as that of which you accused me in the enumeration of these eight equations. My error, however, was corrected before it appeared in print, but his are obstinately maintained, notwithstanding the absurdity which I have shown to follow from them, and which you admit, for you say that "it is true that $n+t$ *can be considered as variable*, it being constant for each shell, its value depending in all cases on the outer and inner radius, and the pressure on the terminal surfaces;" this is precisely what the "Civil Engineer" disputes; so now, having done with him, I proceed to the point at which you ask me to resume my investigations.

You admit all that I require in my second and third propositions, when you say that "the expressions under these heads were correct enough, if only the *assumption* on which they are based could be deemed correct;" that is, "if the tension could under any circumstances be uniform throughout the tube and equal to T," (not the breaking, but) the greatest safe tension. This was all I wanted to establish in these propositions; the way in which this tension may be produced was the subject of my fourth proposition, and is as follows: I conceive the tube in question to be divided into an *infinite* number of concentric shells, and I inquire what the tension of *each* of these shells would be if all those external to a *given* one were removed; that is to say, if the pressure on the external surface of this shell were removed, or (which is the same

thing) if a pressure equal and opposite to it were applied. This question you will find solved in my equation (16), and I find that, *if* the tensions were previously those given by your equation (XI), then, when every shell whose radius exceeds y is removed, the tension of the shell whose radius is x will become $T\ \dfrac{R(x^2-ry)}{x^2(r+y)}(16)$; the proof follows at once from the principles you have given in page 179 of the Magazine; and the tension of the external shell itself whose radius y, will be $T\dfrac{R}{y}.\ \dfrac{y-r}{y+r}\ ..\ (a)$. Now inverting this process, I say that if we give to y successively all the values from r to R, we will get from equation (a) corresponding values for the tension with which each shell should be fastened on in order that finally, when the last shell is put on, the tension should have the values expressed in your equation (XI), and then, if an internal pressure $T\ \dfrac{R-r}{r}$ is applied, the tensions of all the shells will become equal to T. This reasoning involves no principle which was not equally involved in the equations which you have already admitted, so I presume you will go with me so far: then I went on to say that "in order to produce the required pressures on the successive shells of which the tube consists (*the number of which theoretically should be infinite*) it would perhaps *practically* be sufficient to divide the thickness into four or a greater number of equal parts." Your objection to this (if I understand it correctly) is, that "so long as the number of the rings is finite the condition of uniform extension throughout is impossible." So I said too, but I conceived that a *sufficiently* uniform tension for *practical* purposes might be attained by a moderate number of shells, and I suggested four as a convenient number, and calculated the *mean* tension with which each of them should be put on, in conformity with my equation (16); and it was here that a knowledge of the true value of k became necessary in order to know how much the rings should be squeezed to produce this tension, or what difference of temperature would produce the required effect; unknown values of e and E would have failed in this numerical calculation.*

So much for the mathematics; but there is still a physical difficulty suggested by the "Civil Engineer," as interpreted by you (for I confess that I did not understand him), namely, that the "normal action will go on until the whole of the successive rings have accommodated themselves to the circumstances of a single tube, acted on by an external force corresponding to the tension of the upper film." This is a novel theory. The fundamental notion of this single tube is, I suppose, that there are no abrupt changes of tension; and certainly if the successive rings were made of India rubber and cork, and if the outer ones were tightly strained, the inner ones would be compressed; so that at the surface of contact the sign of t would change abruptly from positive to negative. I imagined that the same thing would occur if an iron hoop were tightly strained on an iron cylinder, and that if there were a succession of such hoops, one outside another, the outer ones would alter the tensions of the inner ones, but never destroy the abrupt changes so as to reduce them to the condition of a single tube—unless the pressure or the temperature were so great as to destroy the elasticity of the iron—an accident which Mr. Mallet took care to avoid. If, however, the normal action itself tends to produce this effect, it must be from some peculiarity in the nature of iron different from that of India rubber and cork; and it is easy to ascertain, by direct experiment, whether such is the case. If so, my equations will fail utterly for iron; but they will still be true for any substance whose normal action is merely a pressure similar to that of a fluid surrounding the cylinder; for this will certainly propagate a pressure throughout the mass without necessarily destroying the inequalities of pressure which previously existed.

I am, Sir, your obedient Servant,
A. S. Hart.

Trinity College, Dublin,
Feb. 23, 1857.

[We are most happy to make amends whenever we have, through misapprehension, or any other misfortune, committed an injustice. It seems that we wronged Dr. Hart in attributing to him the mathematical solecism of considering as general equations and available for the purpose of eliminating some of the unknown variables the "known values of n at the outside and the inside of the cylinder." The equation in question, it seems, ought to have been

$$\frac{d(n\rho)}{d\rho}=t.$$

* It is not difficult to investigate formulæ according to the other law of elasticity, and I believe that the value of $\dfrac{t}{r}$ will (if $l=0$) be found to be identical with the value of k as determined by the usual experiments. If so, the formulæ will in this case require no alteration.—A. S. H.

We thank Dr. Hart for his explanation, for we should never have guessed that this *general* relation between the variables n and t, which being of a *differential* form, has nothing apparently to do with *known* values, or with the terminal surfaces, is that furnished by the "known values of n at the outside and inside of the cylinder." We of course never thought that Dr. Hart had committed such a blunder with his eyes open, but that he had been betrayed into it in the ardour of his indignation against the unfriendly Reviewer. We frankly admit his explanation, and regret we should have wronged him.

Nor could we have guessed that in commenting on the Reviewer's mode of dealing with his equations Dr. Hart had in view two imaginary equations which the Reviewer had never dreamed of. In fact he insists on his taking two equations of his own selecting in place of *one* which had been adopted, and then brings him to task for using one more equation than necessary for the determination of his variables. Why the Reviewer preferred his own equations to those which Dr. Hart so kindly presses on him is no concern of ours. We must leave these two gentlemen to settle that matter between them. We are content with reiterating our opinion that on the assumptions actually made the Reviewer's solution of the problem is mathematically unassailable.

Nor can we quite subscribe to Dr. Hart's statement that the two coefficients, k and k', disappear from his expressions by the simple assumption of their equality. This will account for the disappearance of one of them (and of the ratio, $\frac{k}{k'}$, which appears in the general solution), but not of *both*. On referring to his solution the Doctor will perceive that, after making this assumption, k still remains; and that on making $P=o$ when $x=r$, he obtains

$$k\,\Delta=\frac{R}{c},$$

and afterwards, on making $P=Fr$ when $x=o$, he obtains

$$Fr=\frac{k\Delta}{2}\left(\frac{R}{r}-\frac{r}{R}\right)$$

and thus eliminates k and Δ at the same time. Of course the knowledge of the value of k or of e and E is required for the determination of the breaking tension, and consequently of the greatest safe tension which is assumed to be a definite part of it.

These are all very trivial matters, and we should have abstained from noticing them but for the attempt of Dr. Hart to discredit the rival investigation. Where was the necessity for this? We have shown that they amount to the same thing, and result in absolutely identical expressions.

We have already expressed our regret that Dr. Hart's retraction of his "error about external pressure on a simple cylinder" did not reach us in time to enable us to correct our comment on his letter of the 10th ult. Every one is liable to commit a fault of this kind, and his ready acknowledgment of it is a full atonement, and we trust will enable him to bear his "castigation" with equanimity.

We have already published our reasons (in No. 1751) for adopting Dr. Hart's general views on the effects of shrinking on rings at different temperatures, and for rejecting the objections of the Reviewer. The Doctor says he did not understand these objections, and as it is possible that we may have misunderstood them, we think it better to quote those passages from the review from which we derived our notions of them. After detailing the mode of construction of the built-up gun, and the advantages Mr. Mallet conceives to be derived from it, the Reviewer proceeds thus :—"This, as it seems to us, is a fallacy, and upon it the whole of Mr. Mallet's scheme for the improvement of guns is founded. In assuming that such a relation can be established between the compressions and tensions of the several cylinders originally, that after the pressure of the gunpowder is applied they shall be in the same state of tension, he seems to us to have entirely overlooked the effect of the normal elasticity in determining that relation. It cannot be determined arbitrarily by any contrivance of shrinking on at different temperatures; *for immediately that any one of the rings is so fastened on, it produces a normal compression, and alters the tension of all the other rings in a degree depending solely on the magnitude of the rings if the material be supposed equally elastic; or, if not, then on those magnitudes and the several coefficients of elasticity.*" And again: "Whatever the tension and compression might have been originally, the rings so accommodate themselves to each other, *by means of their normal compressions*, that the tension of the complete gun must increase" [decrease?] "from the interior outward in quantities proportional to the square of the distance from the axis of the cylinder, as in equation (7)," viz.,

$$t=\frac{a^2}{r^2}\,\frac{R^2+r^2}{R^2-a^2}p.$$

These passages seem to us fully to estab-

lish our inference that, in the Reviewer's opinion, "the normal action will go on until the whole of the successive rings have accommodated themselves to the circumstances of a single tube acted on by an external force corresponding to the tension of the upper film." If the words we quote do not bear this meaning, we are unable to attach any meaning to them.

It seemed to us that the difficulty here started, required to be removed before we could adopt Dr. Hart's view on the effects of shrinking on. The hinge of the objection is evidently the presumed fact that there cannot be an equality between the mutual normal compressions at the surfaces in contact of two cylinders without a corresponding equality of their states of tensions. Show that this presumed fact has no real existence, and the whole force of the objection is removed. In the letter published to-day, we believe Dr. Hart satisfactorily disposes of this "fact;" and in our opinion he has established his case. In our last number, we stated our reasons for believing that an equality of the normal tensions at the conterminal surfaces of two contiguous rings, by no means implies a similar state of tangential tension of the surfaces themselves. There may be abrupt changes of tension at these points; and as the Reviewer's objection is founded on the tacit assumption that this state of things cannot exist, we must reject it as inadmissible on a full inquiry into the true physical conditions of the problem. Dr. Hart, we conceive, may now be allowed to have established his case. In one point only, and that *as regards the principle* of minor importance, we cannot quite agree with him. It is this— that in calculating the effects of shrinking on of a *finite* number of rings, on the assumption that the number is infinite, he over-estimates the advantages to be gained by this contrivance. Take his own case of a gun with four rings, each of the breadth of half the bore. According to the notation used by us in our last week's article, the expressions for the tensions of the several rings, after the explosive force of the gunpowder (P) is applied, will be

$$t_1 = P\,\frac{R^2+x^2}{R^2-r^2}\,\frac{r^2}{x^2} - P_1\,\frac{r^2+x^2}{r_1^2-r^2}\,\frac{r_1^2}{x^2} \quad\ldots\ldots\ldots\ldots (1.)$$

$$t_2 = P.\,\frac{R^2+x^2}{R^2-r^2}\,\frac{r^2}{x^2} + P_1\,\frac{r_2^2+x^2}{r_2^2-r_1^2}\,\frac{r_1^2}{x^2} - P_2\,\frac{r_1^2+x^2}{r_2^2-r_1^2}\,\frac{r_2^2}{x^2} \ldots\ldots (2.)$$

$$t_3 = P.\,\frac{R^2-x^2}{R^2-r^2}\,\frac{r^2}{x^2} + P_2\,\frac{r_3^2+x^2}{r_3^2-r_2^2}\,\frac{r^2}{x^2} - P_3\,\frac{r_2^2+x^2}{r_3^2-r_2^2}\,\frac{r_3^2}{x^2} \ldots (3.)$$

$$t_4 = P.\,\frac{R^2+x^2}{R^2-r^2}\,\frac{r^2}{x^2} + .P_3\,\frac{R^2+x^2}{R^2-r_3^2}\,\frac{r_3^2}{x^2} \quad\ldots\ldots\ldots\ldots (4.)$$

It is evident, on inspection, that the greatest tension for each of these rings is on the lower surface; making these tensions equal to the greatest safe tension, T, and introducing the conditions that

$$r_1=\frac{3r}{2},\ r_2=2r,\ r_3=\frac{5r}{2},\quad R=3r,$$

we obtain

$$\frac{5}{4}P-\frac{18}{5}P_1=T \quad . \ . \ . \ . \ . \ . \quad (5.)$$

$$\frac{5}{8}P+\frac{25}{7}P_1-\frac{32}{7}P_2=T \quad . \quad (6.)$$

$$\frac{13}{32}P+\frac{41}{9}P_2-\frac{50}{9}P_3=T \quad . \ . \ . \quad (7.)$$

$$\frac{61}{200}P+\frac{61}{11}P_3=T \quad . \ . \ . \ . \ . \ . \quad (8.)$$

* In our hurry last week we allowed some numerical errors to creep into our determination of these quantities; their true values are as follows:

$P^{*} = 1{\cdot}554$ T very nearly.
$P_1 = 0{\cdot}26$ T „
$P_2 = 0{\cdot}20$ T „
$P_3 = 0{\cdot}009$ T „

Whence it appears that the explosive force of the gunpowder cannot much exceed 1½ instead of 2½ times the value of the greatest safe tension.

We cannot regret that this discussion has arisen. The interest and importance of the subject deserved that pains should be taken to meet all such objections as might fairly be raised. We think the Reviewer's main objection a fair one, and such as might, at first sight, seem to rest on a solid foundation. The very dry mathematical form in which Dr. Hart's investigation appears in the note to Mr. Mallet's work, with scarcely a word on the physical conditions of the problem, leaving the reader to infer these for himself, rendered it peculiarly liable to an attack on this side. Dr. Hart had evidently, by previous reflection, satisfied himself on the true physical conditions. It is

a pity that he had not remembered that those to whom his calculations were offered had not had the advantage of previous mature thought; and, in any case, we think that, for the benefit of the great bulk of readers, a little preliminary discussion on such points is never misplaced, and generally attended with great advantage.

In conclusion, we willingly record our general adhesion to Dr. Hart's views, and congratulate him on so successfully meeting an objection which, at first sight, appeared very formidable.—Ed. M. M.]

THE REGISTRATION OF ASSIGNMENTS OF PATENTS.

The following law case is one of very great importance to persons possessing patents, or interest in patents. It shows the absolute necessity of compliance with a section of the Patent Law Amendment Act, referring to the registration of assignments of patents, which has been hitherto too much neglected by persons purchasing patent rights, to whom it is of the highest consequence.

COURT OF QUEEN'S BENCH, GUILDHALL, FEB. 19.

(*Sittings at Nisi Prius, before Lord Campbell and a Special Jury.*)

CHOLLET V. HOFFMAN.

Sir F. Thesiger, Mr. Bovill, Q.C., and Mr. Webster for plaintiff, and Mr. Edwin James, Q.C., Mr. Hindmarch, and Mr. Manisty for defendant.

The plaintiff, M. L. Chollet, of Paris, sued defendant Hoffman, the agent of a Frankfort house, for damages for infringement of a patent granted to E. Masson, 12th Nov., 1850, for "improvements in the preparation of certain vegetable alimentary substances, for the provisioning of ships and armies, and other purposes where the said substances are required to be preserved." Plaintiff sued as Masson's assignee.

Sir F. Thesiger, in opening the case, said Masson was gardener to the Central Horticultural Society of Paris, and sold his patent to Chollet. In 1851 the invention was introduced into England, and obtained a prize medal at the Great Exhibition of that year. At first the trade slighted it, but it ultimately was adopted by our own and foreign Governments. No fewer than 800,000,000 rations of the preserved vegetables were consumed in the Crimea during the war. The treatment of the vegetables was as follows:—They were desiccated by exposure to heated air, then placed on wicker shelves and dried, and then powerfully compressed, by hydraulic pressure, so as to become impervious to air.

The deed of assignment, executed by the patentee to the plaintiff, on the 28th of March, 1855, was then put in.

Mr. James at once objected that the plaintiff could not sustain the action without proving that the assignment had been registered in the "Register of Proprietors," as required by the Patent Law Amendment Act of 1852, 35th section.

Sir F. Thesiger was astonished at the objection, and tried fruitlessly to set it aside. He then declined to be non-suited, and

Lord Campbell directed the jury to find a verdict for the defendant upon the issue as to the assignment, and discharged them from giving any verdict as to the other issues.

A Practical Treatise on Cast and Wrought Iron Bridges and Girders, as Applied to Railway Structures, and to Buildings Generally; with numerous Examples, drawn to a Large Scale, selected from the Public Works of the most Eminent Engineers. By W. Humber, Assoc. Inst. C. E. Parts II.—VIII. London: E. and F. Spon, 16, Bucklesbury.

We are now, with eight of Mr. Humber's parts before us, in a position to judge both of the aim and the execution of this work.

A few years since, when the introduction of railways led to the prosecution of numerous great engineering works, the engineer found himself almost entirely without precedents, and indeed without guidance of every description in his undertakings. The wonder is that he, being thus left to his own unaided resources, has succeeded in constructing the many and gigantic works which now exist on every hand. In producing these much experience has been gained, and the art of applying iron to the erection of railway structures and buildings generally has continually improved. To render this experience fully available, it became highly desirable that a number of examples of the best of these applications of iron should be brought together in one work. It is to this task that Mr. Humber has applied himself, and he is, in our judgment, executing it admirably. The examples given are well selected, and the plates and descriptions are of an essentially practical character. At the same time, the author wisely abstains, in his remarks upon cast and wrought iron, from mere speculation, and confines himself to the results of expe-

riments, as given by Hodgkinson, Fairbairn, E. Clarke, and others. The practical utility of the work will secure for it an extensive sale, both at home and abroad.

Adcock's Engineer's Pocket Book, for the Year 1857 *: containing numerous and extensive Tables and Formulæ for use in Superficial and Solid Mensuration; Strength and Weight of Materials; Machinery; Mechanics; Hydraulics; Hydrodynamics; Steam Engines; Chemistry, &c.; together with an Almanack and Diary; Tables of the Times of High Water; List of the House of Commons; and Miscellaneous Information.* London: Simpkin, Marshall, and Co., Stationers'-Hall-court; sold also by G. and R. W. Hebert, 88, Cheapside, and by all Booksellers. 1857.

This is certainly the most useful and comprehensive work of the kind with which we are acquainted. Beside the varied articles enumerated in the title-page, it contains papers on the stability of vessels, water-wheels, winds, windmills, steam, railways, roads, measuring instruments, gutta percha, Bessemer's process (which has no new importance given to it here), foreign weights and measures, ropes, lubricators, and many other subjects, forming in all upwards of three hundred and fifty pages of information, well selected, and, in the main, carefully prepared.

There seems, however, to be some fatality connected with the literature of naval architecture—or else, as is more probable, there is a resolution on the part of incompetent persons to write upon this subject; for the graver of the errors which we pointed out in last year's edition is still retained, and others of a more important character are observable. We will instance two of these, taken from pages 32 and 34. At page 32, "Simpson's Rule" is thus stated:

"Add together the first and last ordinates for a first sum; take four times the sum of the even ordinates for a second; and twice the sum of all the ordinates for a third. Add," &c.

Now this statement of a fundamental rule is altogether wrong. It is true, that the introduction of the single word "remaining," (in the latter clause) will render it correct. But though the blunder is easily corrected, it is of a fatal character, and renders the rule worse than worthless.

At page 34 we read that the complete determination of the *stability* of floating bodies is reduced to the following geometrical problem:

"To cut a floating body by a plane, so that the volume of the segment, multiplied by the weight of a cubic foot of water may equal the weight of the floating body, and that the centre of gravity of the segment and of the body may be in the same vertical line."

Now the fact is, that these conditions might be fulfilled in a vessel possessing no *stability*; indeed, when these alone are fulfilled the vessel is in what is denominated "*unstable* equilibrium," these conditions being merely those of *equilibrium*, while the condition of stability is, that the metacentre shall be above the centre of gravity. We have previously taken the trouble to point out this distinction—which is found among the very elements of hydrostatical science—in a review of Mr. Rawson's "Mensuration," at page 489 of our last volume, and we are astonished that any intelligent Editor should allow such unpardonable blunders to reappear six months afterwards.

We have only to add, that the volume is handsomely got up, and although its contents are very voluminous, it is, nevertheless, strictly a "Pocket Book."

ON THE FORM OF SHIPS.

To the Editor of the Mechanics' Magazine.

Sir,—"A Mechanic," who has contributed a letter, of several columns, to Number 1748 of your Magazine, makes a sharp attack on a critique of mine, in Number 1743, having for its subject a pamphlet, by Mr. Bland, treating on the form of ships and boats. There might have been difficulty in gathering from "A Mechanic's," communication his self-declared status in society, except for the want of polish in his address. I fancy, however, from another letter of his, in the same Number of the Magazine, that his daily occupation is connected with the subject we have in view, and consequently he has a natural jealousy of amateurs, like Mr. Bland, and cannot believe any good will come out of Galilee. Every one has had occasion to observe, in life, the inveteracy of long habit; and the strong aversion to novelties in routine, which is commonly found in men engaged much in one business. I trust I have no prejudice whatever in the subject, but, for myself, I am always glad to hear the opinions of others, being convinced of the benefits frequently arising from temperate discussion. I came before the public at first exactly as I do now, not in an attempt at undeserved flattery, but partly applauding and partly contesting the opinions in the "rudimentary" pamphlet. I still admire the author's patience, methodical arrangements, freedom from bias, succinct collection of many details in a small compass, and still concur with some of his deductions, though now, as then, I differ from him in several others.

"A Mechanic" commences his strictures with the statement that, Mr. Bland's experiments are "really insignificant" and "undoubtedly puerile." I ask leave to differ *in toto*. If, for example, "A Mechanic" can see nothing of consequence in Sir Isaac Newton's blowing soap-bubbles, the puerility appears to me, with submission, to attach to the spectator who derides, rather than to the philosopher who experimentalises on important truths, though with insignificant materials.

The next charge against me is, that I have given an impression

"That Mr. Bland has come to some serious conclusions relating to the speed and form of ships either at variance with, or in advance of, those principles which are ordinarily received; and yet in the book [pamphlet] itself is found only *one* proposal pretending to be an improvement."

On this charge, also, I meet my adversary foot to foot. Mr. Bland, in his little work, does promulgate *many* alterations to existing routine-architecture, which cannot escape the notice of even a very superficial reader, but which, strange to say, "A Mechanic" could not see, either in the Essay itself, or in my review, at page 6 of the *Mechanics' Magazine*, in its present volume. Shall I repeat, as instances of the novelties —first, increased beam; second, reduced average depth; third, curvilinear bottom longitudinally; fourth, centre of gravity to be kept level with load water line; fifth, that a slightly convex bow is faster than a straight or hollow lined one; sixth, that cutting off external angles in mid-ship sections will increase speed but lessen stability, &c., &c.

In the third place, I am attacked about a statement upon line-of-battle ships, and charged with being contradictory and unintelligible. I am quoted thus—

"The draught amidships is fixed at such a measurement as under a bracketed form of bottom * * * would amount to only two-fifths of the beam. The reader perceives that in the latter case the draught of the present three-deckers would be reduced from 25 feet to about 12 feet!"

My opponent, or shall I say my assistant, then remarks on this,

"First we are informed that two-fifths of the beam should be the draught of water, and are afterwards told that by this arrangement a three-decker would draw 12 feet; now, 12 feet are two-fifths of 30 feet; hence, it follows that a three-decker should be 30 feet broad, and draw 12 feet of water!"

Surely never was there a more deliberate perversion, or a more careless blunder —a vital part of a sentence is completely struck through, and then the remains are barbarously and illogically mangled. The reader, upon referring to my humble contribution, will find that the following words have been curiously omitted, which should have been inserted in the preceding quotation, where the invidious asterisks now appear—"or if the immersed part were perfectly rectangular only *one-fifth* of the beam." So that my meaning most clearly and distinctly was, that Mr. Bland proposed; if the midship section were ever perfectly rectangular, that the depth should be but one-fifth of the beam; or 12 feet to a width of 60 feet, which is about the present beam of three-deckers. Without these omitted words, the succeeding sentence in my letter, referring to "the latter case," *would* be unintelligible; but I must be excused in quoting hereupon an eminent writer, who says, as though he might be referring fatidically to "A Mechanic," that "he makes the sentences ridiculous, by making them *his own*."

Fourthly, I am again charged with conveying a false impression, by inferring that Mr. Bland has made discoveries which have hitherto baffled the attempts of naval architects, while he really has confined his attention to the angles of ships' bows and bottoms. This is merely a repetition of the second count against me, to which I have already replied. I may, however, first call attention to the circumstance that, "A Mechanic" in that count begins by saying, Mr. Bland pretends to only one improvement (increase of beam) while now he gives him credit for attempting a second and third.

I could really wish that more ordinary courtesy had been observed, by "A Mechanic," towards our author, than to tax him with using models "small enough, but too rude for toys for the nursery." It appears to me that they were as large as many of the models lent, as a great favour, by the Admiralty, to the Exhibition of 1851, and I have yet to learn that size is a guarantee of accuracy, though, in my former letter, I certainly wished their scale *had* been more extended. When my commendation of Mr. Bland is stigmatised, as "advancement of absurd pretensions," I have no reply to make; but I must remark, it is at least odd, that experiments should one moment be spoken of in the most contemptuous manner; and in the very next, an admission made of the "ingenuity observable in them," while, soon after, all is politely termed "stuff" and "worthless."

"A Mechanic" now proceeds, fifthly, to occupy two columns about a quotation of a part of Mr. Bland's work, which I have never attempted to remark upon. But, as we have noticed before, he is not happy in his quotations—he argues about 10 ounces, which he takes as the motive force, while I think the reader will, with me, understand it to be the weight of the *models themselves*,

which, as in other experiments, were brought to an equality before each trial. Hence, the perplexity of his ideas, when trying to comprehend the paragraph; hence, the futility of what he has guessed respecting it, and hence, a singular example of the force of his own caution, viz.:

"There is nothing of more importance in a set of scientific experiments than that the first principles which form the substructure of the whole should be free from error, because an error in these is often repeated and multiplied to such an extent as utterly to mar the result."

In the sixth place, Mr. Bland having asserted, when there are two floating bodies of similar and equal rectangular sections, but one body double the length of the other, that the longer has treble the stability (supposing the small body to be square and the other oblong) my censor remarks upon this, that it is erroneous and opposed to common sense; but he once more omits to notice a consideration, that inserted in the parenthesis, and omits also to state that the work mentions this proportion of triple stability as much lessened, and finally "takes the arithmetic ratio" as the bodies are respectively increased in length, much beyond the square form. He argues that if two similar floating bodies be placed together end to end, they would form one of double the length and double the stability. It may be so, but from this mode of reasoning, it would follow that if the two similar bodies were united inflexibly *side to side*, the stability of the joint mass would be doubled; but every one knows, on the contrary, that stability increases almost as the *cube* of the breadth, and why not the length affected by an analogous law?

"A Mechanic" finally takes occasion to ridicule Mr. Bland for proposing a rough and ready mode of ascertaining the centre of gravity of ships by three cups of water. I am not aware that this plan was proposed as the best or the only means, but it strikes me, notwithstanding my controversialist's disposition to laugh yet again, that it is a tolerably correct and very prompt method when a vessel is under way, and when there are not the facilities of moving weights, of finding exact volumes of immersion and emersion, the total displacement, &c., that there are in a dock.

Allow me, Sir, to conclude by saying that I do not at all wish to doubt the fair intentions of my adversary, but I do think, from the tenor of his communication, that he has a prejudice against the work in question, or against the amateur author; and certainly, I must be excused accepting his objections until I observe that he reads with a clearer comprehension, and with more care, the opinions of others, and quotes with far more correctness than he has yet shown, either in his notices of the rudimentary treatise, or of my review.

I am, Sir, yours, &c.,

H. Y. P.

Feb. 18, 1857.

To the Editor of the Mechanics' Magazine.

Sir,—"A Mechanic" is quite right in condemning the very clumsy method by which Mr. Bland has investigated this subject; for, as he truly observes, in small models, minute errors are of great importance. The force is unnaturally applied, and consequently does not answer the purpose for which it is intended, nor elucidate what it is meant to show. I suppose that by the number of ounces is meant a force equal to them, which was applied either by the experimentalist himself (as from the description I should conceive) or by means of a weight. I certainly cannot see from the way in which the experiments appear to have been performed, how the difference in ounces could be arrived at, unless it was by seeing what force would move each of the bodies in comparison separately, and then finding the difference. From the diagram given, it appears that the two blocks are applied to the lever at one time. This being the case, and equilibrium being found by moving the string, we find in experiment, that one side of the lever is 1⅛ in. longer than the other. As from the dimensions, the blocks 2 and 3 would weigh more than 1· and 2 together, they would require a greater weight to move them through the water, as we find they have. If the weight was no more than that employed in the experiment, they would as a natural consequence move "sluggishly." The reason why the difference between the two sides of the lever in these experiments is 1⅛ ins. is because the different widths are proportionate to those of the two bodies used in the first experiment.

I have seen an experiment for determining the proportion and amount of resistance offered by water, and ascertaining the best form for the fore part of vessels, which, with your permission, I will describe. In the centre of a common tub, or other similar vessel, a vertical rod should be placed, so as easily to move round; connected with this by a horizontal rod, should be a small model of the fore part of a vessel. On the top of the vertical rod, a pulley must be fastened, in connection with which should be a string, which again must pass over a vertical pulley at the extremity of the vessel. At the end of the string, a weight must be placed. When the vessel is filled with water, the weight will pull the model round with greater or less velocity, according to its shape and the surface

directly opposed. This motion is quite natural, and completely illustrates what is required. It seems to me that the shifting of the string answers the same purpose as moving the weight.

I am, Sir, yours, &c.,

SEMIRAMIS.

STEAM SHIP ARITHMETIC.

To the Editor of the Mechanics' Magazine.

SIR,—I request your permission to say just one or two words in answer to Mr. Atherton's letter in your Number 1749.

I thank Mr. Atherton for the pains he has taken to explain his views to me, and I regret that he has not succeeded in enlightening me, but has left me in as great darkness as before. This gentleman might, however, have spared himself the trouble of pointing out to me the facts relating to the varying duty of a Cornish pumping engine; in the first place, because he could not reasonably expect me to understand what he has said, unless I had previously obtained a knowledge of the subject; and because, on the other hand, having that knowledge, I perceive that such an illustration is not at all adapted to assist me in my difficulty. It is quite easy to understand what is meant by the duty of an engine. It may be simply defined as the amount of work done by the engine, with the expenditure of one bushel of coals. I desired an equally brief and equally intelligible definition of Mr. Atherton's phrase, "*dynamic duty*;" and if these words have a definite meaning, they can be so defined. The attempt of Mr. Atherton occupies a column and a half of the *Mechanics' Magazine*, and yet, unfortunately, the point is not approached. Surely, if these terms signify anything capable of accurate statement, their exact meaning may be clearly exhibited, even in less space than this.

In the opening of the letter, Mr. Atherton tells me that this formula does not indicate the gross amount of work a ship is capable of performing. I knew that before, and of course had not any doubt on that point. I wished to be informed in specific concrete terms, what it does, and not what it does not indicate. In answer to this, I am told that "it comparatively indicates the working condition, constructive adaptation, fitness, efficiency, or inefficiency of the means employed with reference to the effects produced." This is exactly what was said in the first letter on the subject, but the terms are too abstract, and so vague that one does not know what value to attach to them. After such an exposition, I am obliged, in amazement at such a *cloud* of long dense words, to ask *how* can this formula do all this? Am I to understand Mr. Atherton to believe that his coefficients of "dynamic duty," indicate the comparative efficiency of various ships, as the quantity of work called duty, represents the working efficiency of a steam engine? If so, I can only say that I shall not join him in such a scientific heresy. We are told that the duty of a Cornish engine is independent of the magnitude of the machine. This is very true, but it is not independent of the relation which the work done bears to the consumption of fuel—that is, not independent of the economical character of the engine. But Mr. Atherton's index of locomotive merit is, as I have previously shown, quite independent of any such relation. It does not represent nor indicate what a ship will do at a given cost, and, therefore, cannot be reasonably called "dynamic duty."

If it is merely meant that the greater this number is in any case, the greater is the economy of power in relation to *realised speed*, in that case, I have no objection to offer; but if it be said that this economy is in *proportion* to this index number so called, I must express my dissent from such an opinion. This formula has already been put to the only legitimate use to which it can be applied, without any recommendation from Mr. Atherton. Such vague hints as he gives us of the mode in which he would apply it, and of the offices he would assign it, do not enable us to pronounce with certainty upon their merits.

There is one thing in the last letter of your correspondent which rather adds to my intellectual embarrassment. It is intimated that there is a distinction between a ship's economy and her efficiency. It appears to me that efficiency always means economy, and I find it quite impossible to separate the two. How two vessels can be at the same time equally efficient, and unequally economical, I do not hope to learn. I shall not, therefore, read all Mr. Atherton's writings on this subject, for the purpose of realising this distinction. I have not time to bestow upon such a pursuit. "Economy" is too important to me. If the other productions of this author contain no more instruction per page than this last letter, I do not see what good I could get by the perusal. So, thanking you, Sir, and Mr. Atherton, I say farewell to this scheme of Steam Ship Arithmetic.

I am, Sir, yours, &c.,

A MECHANIC.

THE ROYAL CORNWALL POLYTECHNIC SOCIETY.

To the Editor of the Mechanics' Magazine.

SIR,—My attention has this day been directed to a letter signed "Cosmopolitan," which appeared in your Journal, for January 3rd. Although the tone of the letter would suggest the propriety of silence on the part of any one connected with the Institution named by your correspondent, yet, so many representations which are totally devoid of truth are made respecting the Royal Cornwall Polytechnic Society, that I feel it right to place you in possession of a few facts in relpy, lest the statements made by "Cosmopolitan" should, by remaining uncontradicted, injure one of the most useful of our existing institutions.

1. The Royal Cornwall Polytechnic Society has not *lately appealed to the public for assistance*, "like the London Mechanics' Institution;" it is not incumbered by debt; there has been no falling off in the number of subscribers; and, as far as its funds are concerned, it is in a healthy state.

2. This Society does not pride "*itself on having rewarded with a sum of £10, a clumsy substitute for the system of lowering and lifting miners, in use in the English and Welsh coal-mining districts.*" The Society gave the adventurers of Tresavean mine, who introduced the "man engine," as it is termed, *the premium of £500 offered, and to Mr. Michael Loam, the engineer, the premium of £50.* Had your correspondent known anything of the existing differences between the modes of working a Cornish mine and a colliery, he would not have used the terms which he has employed.

3. The Society's report of the last meeting, held in September, has not yet been published, consequently your correspondent could not have perused it.

4. The remarks on the tin-dressing machines carry their own replies; but that "*the medal is given on the condition of the invention becoming public property,*" is as untrue as the other statements. In proof of this, at each year's exhibition, we find inventors, in different branches of industry, eager to send their machines, apparatus, or tools, as the case may be, to the Hall of the Royal Cornwall Polytechnic Society. Patented inventions are not open to compete for the Society's prizes, but patentees are glad to avail themselves of the Society's annual exhibition.

5. A premium *of £100 was offered in the last year's list of premiums*, and I suppose it is continued, and not of £10, as stated, for a mode of ventilation applicable to Cornish mines. It has not been awarded, because the judges have not been satisfied of the applicability of the plans brought before them.

It is true that in the Cornish mines there are "hot levels" and "close ends," the injurious effects of which are well known, and for these, remedies are constantly sought; but so far from the mines of Cornwall being the most "unhealthy mines in any quarter of the globe," there are no mines in the world in which, to such extreme depths, general ventilation is so perfect.

6. "Can it be a matter of surprise that the Society is falling into contempt and pecuniary difficulties?" The Polytechnic Society still continues its work of usefulness, supported by the largest mine proprietors and land owners of the county in which its work is done. Its friends are ignorant of any contempt beyond that of the occasional expression of this unfortunate feeling on the part of presuming ignorance disappointed in receiving the Society's rewards. *It is not in pecuniary difficulties*, and the only matter of surprise is, that any man calling himself a "lover of progress in science," should deliberately pen so many misstatements and false deductions from them.

I am, Sir, yours, &c.,

A LATE SECRETARY OF THE R. C. P. S.

ON SUPERHEATING STEAM.

To the Editor of the Mechanics' Magazine.

SIR,—Perhaps you will be so good as to appropriate a small space in your journal to afford me the opportunity of supplying an omission or two in my last communication.

Where the surface of the steam pipe is found insufficient, and particularly where the encasement of the cylinder is not carried out, a correction may be conveniently effected by passing the heated air through subdivided passages *within* a steam chamber connected with, or forming a continuation of, the steam pipe. Again, an appreciable further saving of fuel can be made by subjecting the boiler feed water to the influence, under a due extension of surface, of the return hot air. Lastly, it is well to point out the distinction between the described plan, and that of employing the direct action of the waste gases from the fuel, the former presenting an easily governed, innocuous, and equally diffused current of heating medium, without the deposit of soot or extraneous matter on the interposed metal, the practical advantages of which are sufficiently obvious.

I am, Sir, yours, &c.,

THOMAS HOWARD.

King and Queen Iron Works,
Rotherhithe, Mar. 2, 1857.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

JOHNSON, J. H. *Improvements in railway breaks.* (A communication.) Dated June 24, 1856. (No. 1483.)

This relates to certain railway breaks, whereby the carriages are lifted off the rails, and rest with the whole of their weight upon suitable drags, shoes, or skids, which are brought instantaneously into contact with the rails at every carriage throughout the train if desired.

BOWER, L. *An improvement or improvements in the manufacture of bolts, rivets, spikes, screw blanks, nuts for screws, and washers.* Dated June 24, 1856. (No. 1484.)

In the manufacture of such articles a vacuum stamp, or a stamp the ram or hammer of which is raised by the exhaustion of the cylinder is employed, the ram being connected with the piston working in the said cylinder.

LAFOND, J. E. *Improvements in lighting.* Dated June 24, 1856. (No. 1487.)

This relates to apparatus for self-generating gas for lighting, which apparatus cannot be described without illustrations.

GARDISSAL, C. D. *Improvements in engraving glass and crystals.* (A communication.) Dated June 24, 1856. (No. 1489.)

Claim.—Engraving glass and crystal with hydrofluoric acid, by the aid of "reserves," "spares," or "resists," produced by either of several described processes.

BUFF, H. L., and F. VERSMANN. *An improvement in purifying and softening water.* Dated June 25, 1856. (No. 1490.)

Silicate of soda is applied in combination with carbonate of soda, or other matter known to precipitate lime.

KEILLER, A. *Improvements in the manufacture of articles of confectionery.* Dated June 25, 1856. (No. 1492.)

In making pan goods, the pan, which has an external steam jacket, is suspended by overhead links. During the working it is made to revolve continuously, so as to give the ingredients the necessary rolling working action. Steam is supplied to the jacket, and the bottom of the pan in the interior is convex, so that the goods produced are caused to roll off, and form an annular layer, spread evenly instead of falling into a thick mass. In making lozenges the discs are punched out by solid punches upon a perforated table.

CHANDLER, R. W., and T. OLIVER. *Improvements in engines employed for agricultural purposes.* Dated June 25, 1856. (No. 1495.)

A drum for holding the band, strap, or chain employed with agricultural engines, is fixed upon the axle of the fore or hind wheels. Or the patentees convert either fore or hind wheels into drums, by raising them from contact with the ground, and attaching flanges to the sides to prevent the band slipping off.

PLATT, J., and J. WHITEHEAD. *Improvements in machinery or apparatus for making bricks.* Dated June 25, 1856. (No. 1498.)

1. The driving parts of brick machinery (in which a series of moulds is traversed by a "mangle-wheel motion,") are made adjustable to the angle required by the motion of the pinion in the mangle wheel. 2. The machinery patented by J. McHenry, July 25, 1852, has applied to it apparatus for loosening the bricks in the moulds before forcing them out, and other apparatus for preventing the pistons forcing them out if the moulds are not properly full.

KENYON, J. and R. *An improved fabric to be used in printing and other similar purposes, and a method of joining or connecting the ends of the same.* Dated June 25, 1856. (No. 1499.)

The endless aprons, sheets, or bands of cloth that form a bed for the fabric to be printed upon in printing machines, is to be formed of a linen fabric woven at the ends, so that a joint of equal thickness with the cloth may be produced.

CORNIDES, L. *Improvements in ornamenting metal, wood, leather, textile fabrics, and other substances.* Dated June 25, 1856. (No. 1500.)

The surfaces are first metallized (as in former patents), and then coated with a solution of ox-gall, or a transparent varnish, and when dry, a solution composed of 4 parts gelatine, 1 of sugar, 1 of glycerine, and 6 or 8 of soft water is applied as a coating on which to transfer the impressions, or to attach thereto such impressions made on a transparent medium.

DURRICH, G. *Improvements in gas burners.* (A communication.) Dated June 26, 1856. (No. 1501.)

This consists in contracting the tubular neck beneath the burner, so that the first passage through which the gas passes shall be smaller than the opening of the burner where the gas is consumed.

GRATRIX, J., and A. KNIGHT. *Improvements in apparatus for registering a permanent record of the speed of steam or other engines, which apparatus is also applicable to Watchmen's Registers and other similar purposes.* Dated June 26, 1856. (No. 1502.)

This consists in making a time-keeper, either with or without the ordinary hands. If without hands, a metal plate is fixed on the centre spindle, and on the plate a dial made of metallic paper, capable of receiving a strong mark from a metal marker. If hands are used, extra spindles are worked by the time-keeper, so that the true time

will always be at the point where the marker acts, the marker being put in action, at any specified time, by a train of wheels similar to clock movements, and immediately released so as not to interrupt the time-keeper. Or motion may be given to the dials by a spring in the box, or by a weight movement; or where it is desirable not to change the paper dial every 12 or 24 hours, a metallic tape or ribbon, with hours and minutes marked upon it, is used.

WHITE, D. *Improved apparatus for the more perfect combustion of gases, for preventing their escape, and the unnecessary radiation of heat therefrom.* Dated June 26, 1856. (No. 1504.)

The gas is concentrated in a chamber shaft, funnel, cylinder, or globe covered on the top, only allowing room for the escape of heat, &c., after combustion, and an external air chamber, shaft, funnel, cylinder, or globe hung under the gas burner, air-tight at the bottom and open at the top, leaving space to allow air to descend from the top to feed the gas flame under the internal chamber below the burner.

MACDONALD, D. *Improvements in printing textile fabrics and other surfaces.* Dated June 26, 1856. (No. 1505.)

This relates to apparatus particularly suited for printing on muslins, according to the zincographic system, designs to be afterwards embroidered; but it is also applicable for printing various devices upon fabrics and other surfaces, according to either the zincographic or lithographic systems. The plate gives an impression during both traverses, one piece of fabric receiving impressions when the plate traverses in one direction, and another piece when it traverses in the other direction.

PORTUS, J. *Improvements in wheeled carriages.* Dated June 26, 1856. (No. 1506.)

In the improved carriages provision is made for the traverse of the body when desired to throw weight upon the shafts, or to take weight off them. When a steep hill is ascended, the traction of the horse draws forward the body and its load, and by suitable gearing the weight is thrown behind the axle when upon a level part of the road. Conversely, in descending a hill, the action of the horse throws the weight behind the axle.

AIKMAN, J. *Improvements in the treatment, cleansing, or finishing of textile fabrics.* Dated June 26, 1856. (No. 1507.)

The treating of goods with the fumes of sulphur is conducted in a long rectangular chamber or building, containing at each end a vertical row of horizontal rollers arranged to revolve in concert. The rollers are driven from a shaft outside the building, and having bevel wheels in gear with corresponding wheels upon the ends of the rollers, which project through the wall. The chamber or building also contains sets of loosely rotating rollers between the two end sets. The fabric is passed in through a horizontal slit near the top, at a level with the highest roller. The piece passes over the first roller, and the intermediate supporting roller, and round the upper roller at the opposite end, then returns to the end where it entered, passing over the second roller and back again, and so on, and finally out at the bottom. The arrangement also is applicable to the sulphuring of yarns and woven goods, and for steaming or damping textile fabrics.

FOOT, J. J. *Improvements in weaving narrow fabrics.* (A communication.) Dated June 26, 1856. (No. 1509.)

This relates to narrow fabrics woven many widths together in a piece; and consists in certain methods of making fast edges where the piece is to be cut apart.

SCARIANO, B., and R. P. DE VILLAMIL. *Improvements in apparatus for measuring and setting out the forms of garments.* Dated June 26, 1856. (No. 1510.)

Several sliding metal rules are pin-jointed together, so as to form a series of moveable triangles placed in juxta-position to each other. These are graduated and arranged to correspond with the points and lines according to which measurements are taken from the body. To some of the rules are fixed bands of steel, also graduated, which bend themselves, and afterwards reproduce on a plane surface the measurements obtained.

HUDSON, W., and C. CATLOW. *Certain improvements in looms for weaving.* Dated June 26, 1856. (No. 1511.)

Upon the occurrence of a float, the displacement of the ends of the warp operates through certain mechanism, so as to cause the spring handle of the loom to be th . . out of its detent, and stop the loom.

SHANKS, A. *Certain improvements in machines for drilling, boring, and cutting metals.* Dated June 27, 1856. (No. 1513.)

Claims—1. The use of two headstocks, each having a drill or tool, and operating simultaneously on the same article, thereby doing the work more expeditiously. 2. The application of cam plates and pins fixed on the axis of the elliptical wheels, to retain them in gear during their entire revolution. 3. The application of a concentric vice to fix the articles.

PRELLER, C. A. *Improvements in unhairing and preparing skins, and in tanning.* (Partly a communication.) Dated June 27, 1856. (No. 1514.)

Cod oil, horse grease, or other fatty or greasy substance, is used with lime or soda, or other alkali, for unhairing skins and preparing them for tanning; and cod oil, horse grease, &c., is used with soda, or other alkali, and the usual materials containing tannic acid (such as oak-bark, mimosa bark, terra japonica, cutch, divi-divi, sumach, &c.), for tanning. Warm water is employed for making the solutions and extracts of these materials, and the skins are agitated while immersed in the liquids.

JOHNSON, J. H. *Improvements in the production of carbonate of barytes.* (A communication.) Dated June 27, 1856. (No. 1515.)

This consists in decomposing an aqueous solution of the sulphuret of barium by the aid of carbonic acid gas, assisted by the presence of potash, soda, or other alkali. The carbonic acid unites with the barium, and carbonate of barytes is precipitated, leaving, however, a slight excess of sulphate of barytes. The sulphuric acid unites with the alkali, and a sulphate of that alkali is held in solution.

BURNAND, E. *An improvement in the manufacture of fire-arms.* Dated June 27, 1856. (No. 1517.)

This consists in substituting for straight rifle grooves a spiral groove, the pitch of which is considerably more obtuse at the mouth of the barrel than at the breech.

ORMEROD, G. H. *Improvements in machinery for brushing and cleaning cotton fabrics.* Dated June 28, 1856. (No. 1518.)

Cotton fabrics are submitted to the action of a revolving roller covered with emery, and of a rotating brush, for removing the leaf or other impurities adhering to the fabric when it comes from the loom.

SLOPER, B. G. *Improvements in freezing, refrigerating, and cooling, and in the machinery employed therein.* Dated June 28, 1856. (No. 1522.)

Intense cold is produced by the expansion of air obtained by pistons moving in cylinders.

McADAM, W. *Improvements in the manufacture of articles of clay and such like plastic substances.* (Partly a communication.) Dated June 28, 1856. (No. 1525.)

In apparatus to be used in place of potters' wheels and potters' moulds, two moveable headstocks are supported by a horizontal bed, with a capability of being moved thereon by racks and wheels. One headstock has a revolving spindle, similar to a turning lathe, and a cutter to cut out and press the clay held in position. This cutter being withdrawn, a supporting frame is drawn into position, to carry a portion of clay to form the bottom to the article to be produced: the other headstock carries a spindle, with a cutter capable of being set at right angles thereto. The two spindles work in opposite directions—the one on the outside, the other on the inside, completing the cutting of the vessel in the bottom. A stationary frame, fixed on a horizontal bed, and closing in parts hinged to admit of the vessel being easily taken out, gives the external figure, and into it the proper quantity of clay is put.

MESSAGER-ABIT, C. A. *Certain improvements in the treatment of fibrous substances.* Dated June 28, 1856. (No. 1526.)

The plants called ligneum spartium, stypa, tenacissima, the chamærops humilis, and the plants of the genera genista and stypa are submitted to bruising cylinders, and the fibres obtained are afterwards straightened, placed carefully in small bundles, and carded when in a cold state in a carding machine. The fibrous substances are then dyed, twisted, and dried by the ordinary processes. The sparta or alpha and the dwarf palm, &c., are treated by steam, by which, with the above processes, a substitute for horse hair, called vegetable horse hair, is obtained.

HENLEY, T. F. *An improved process for obtaining arrack or spirit from rice or other grain.* Dated June 28, 1856. (No. 1529.)

The grain is first subjected to the action of a dilute solution of ammonia. The material is then passed between crushing rollers, and thence it passes into suitable vessels, wherein it is mixed with about three parts of the hot spent wash resulting from a former distillation to one part of the rice, &c., to be operated upon. Steam is then blown through the mixture for about two hours. The patentee next prepares, in a separate closed vessel, a solution composed of three parts (per 100 parts of rice) of hydrochloric acid of specific gravity of about 1·100° and two parts of spent wash, and this he mixes with every 100 parts of the rice, &c. Into this mixture he pumps the former mixture of rice, &c., and spent wash, whilst he maintains within the closed vessel a steam pressure of about 1½ atmospheres for three to four hours. The liquor thus obtained is treated with soda or other alkali until complete neutralisation of the acid is accomplished.

GOODE, S. J. *Improvements in gas stoves, and the application of the same to the ventilation of buildings.* Dated June 30, 1856. (No. 1530.)

Claims—1. The application of the flame of a mixture of gas and air to the heating of a chamber situated in the interior of the body of the stove, the said chamber being supplied with air, either from the apartment in which the stove is used, or from the ex-

ternal atmosphere, which air passes into the apartment after having been heated by its passage through the said chamber. 2. Causing the flame of a mixture of gas and air to enter and heat a funnel-shaped flue situated in the body of the stove. 3. A method of applying gas stoves to the ventilation of buildings.

ROGERS, E., and H. MACKWORTH. *Improvements in cooking, and in apparatus for that purpose.* (Partly a communication.) Dated June 30, 1856. (No. 1531.)

Claims—1. The coking of coal or other suitable material in open kilns, by igniting the mass at the lower part, and causing the coking process to ascend gradually from the bottom to the top, while, at the same time, the air or the gases produced by the combustion or distillation, are caused to descend into, or through the interstices of, the incandescent mass, and thence into flues or chimneys, as described. 2. The coking of coal, or other suitable material, in open kilns, by causing currents of air or gas to pass alternately from side to side of the mass, and through the same, in the manner described. 3. The constructing open kilns or apparatus for coking flues and chimneys, arranged as described.

MORIARTY, C. *Improvements in the construction of tube brushes used in cleaning the tubes of marine, locomotive, and all kinds of multitubular boilers.* Dated June 30, 1856. (No. 1534.)

The wire, hair, or whalebone of the brush is placed in the form of a screw, which has sufficient pitch and space between the threads to admit of the brush being screwed in through the ferrule of the tube. This space between the threads also affords room for the soot and dirt detached inside the tube to lodge, and be drawn out with the brush.

GOODHART, C. W. *Improvements in bars or gratings for the security of buildings and other property.* Dated July 1, 1856. (No. 1536.)

Hollow bars or tubes are used in place of solid bars.

SANDERS, F. G. *Improvements in the manufacture of ornamental floor and other tiles, bricks, slabs, and other similar articles.* Dated July 1, 1856. (No. 1537.)

The above articles are made of pulverised clay in various colours or designs, to render them applicable to decorative purposes, by combining pulverised clay of different colours in such manner that the manufactured articles will have a variegated appearance given to them by the particular arrangement of the materials.

WILD, A. *Improvements in the manufacture of boots and shoes.* Dated July 1, 1856. (No. 1538.)

The principal improvement consists in employing two rows of sewing for connecting the welt to the upper.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

ROBSON, S. S. *Improvements in railway and other carriage breaks.* Dated June 24, 1856. (No. 1485.)

This consists in the use of conical friction surfaces (one upon the wheel fitting into one upon the axle) with suitable mechanism for actuating them.

POPE, A. *Improvements in the manufacture of steel.* Dated June 24, 1856. (No. 1486.)

The inventor uses the ordinary cementing furnace, the ends of the cementing troughs being perforated to allow the hoop-iron to slide through. He threads into the holes in the troughs hoop-iron from end to end, and fills the troughs with a mixture of carburetted anhydrous silicate of alumina and a small quantity of spent oxide of manganese. He fires as usual, and when the whole has arrived at cementing heat, causes the hoop-iron to be moved slowly along. To weld and forge steel he heats it in a chamber pervaded with carbonic oxide, and then forges the steel.

NEWTON, A. V. *An improved construction of life boat.* (A communication.) Dated June 24, 1856. (No. 1488.)

A cylindrical vessel is mounted within an open framing of air-tight chambers, in plan view somewhat like a boat, and fitted with duck's-foot propellers, a rudder, &c. The cylinder is open at its upper side to admit the crew and passengers, but may be closed by sliding shutters when required. The buoyant outer frame may be turned over on its centres by a sea without affecting the position of the cylinder.

ALLEN, M. *An improvement in arranging and working the slide valves of steam engines.* Dated June 25, 1856. (No. 1491.)

This relates to balancing slide valves. Each valve is suspended by a link to a rod passing through a stuffing-box in the cover of the valve-box. The rod is connected to a lever attached to a piston-rod of a steam cylinder, which has a piston within it, on one side of which steam presses, the other side communicating with the condenser.

BATES, G. A. *Improvements in apparatus for the prevention of accidents in ascending and descending the shafts of mines.* Dated June 25, 1856, (No. 1493.)

Sustaining bolts or bars are to be used in connection with the guide or conducting rods in the shafts of mines, so that on any accident occurring, these bolts or bars secure the "cage." These spring bolts are

affixed under the roof of the "cage," and are projected by springs towards the conducting-rods, the faces of which are recessed in notches for the reception of the bolts.

ROHEAD, J. *Improvements in hats and other coverings for the head.* Dated June 25, 1856. (No. 1494.)

The lining is made less in diameter than the hat body, and together with an internal diaphragm, or stiff lining piece, is attached loosely to the body where the brim joins the body. This junction is effected by a strip of gimp or other open material.

SCHELLER, T. *Certain improvements in obtaining and applying motive power.* Dated June 25, 1856. (No. 1496.)

This is a contrivance consisting of wheels, spindles, and shifting weights, intended to produce motive power!

MARESCHAL, J. H. E. *Improvements in hydraulic presses.* Dated June 25, 1856. (No. 1497.)

1. The pressing table is made to serve as a piston. 2. Under the piston is adapted a valve opening at a certain pressure, and serving as a safety-valve, as well as for draining off the water from under the descending piston. 3. A manometer communicating with the water is fitted under the piston for ascertaining the pressure exerted. 4. The press is reduced to a small compass by the above arrangements, and by fixing the cylinder and force-pump on the upper part of the water tank, which has wheels to remove it from one spot to another.

WALLER, H. *Improvements applicable to vessels used in the manufacture of cheese.* Dated June 26, 1856. (No. 1503.)

The inventor employs an apparatus composed of a circular vessel, with a small sliding shutter, by means of which the whey is drawn off from the curd at various levels successively.

MALEZIEUX, F. J. L. *Certain improvements in the preparation of peat, and in the manufacture of the same into fuel, charcoal, and gas.* (A communication.) Dated June 26, 1856. (No. 1508.)

The peat is pulped in a pulping engine, in which it is forced by arms against a drum furnished with teeth or cutters, on which a stream of water flows. The peat pulp may be further reduced by beating or pounding, or by a cane-mill, or by fluted rolls or vertical stones. The purifier is a shoot divided into descending compartments, in which the sulphurous acid and other impurities are deposited. The pulp next passes into receivers to drain, and is then shaped by strips of wood, fastened together at right angles. To prepare peat for illuminating gas, the peat is placed in closed stoves (having an outlet for steam), and subjected to the action of surcharged steam heated by red hot fire-bars. The steam prevents the volatilisation of the carbon, and neutralises the sulphuric acid, thereby adapting the peat to the manufacture of gas, and preparing it as a fuel.

BETHUNE, D. *Certain improvements in apparatus for separating the more fluid particles from the more solid of various bodies.* Dated June 27, 1856. (No. 1516.)

Centrifugal force is employed in a chamber, either entirely or partially closed, by means of suitable mechanism actuated by steam, or other power, and heated air is used in such chamber.

BROWN, E. *Improvements in the casting of sailors' and other pocket-knife handles and scales.* Dated June 27, 1856. (No. 1519.)

The two scales or hafts are cast together by a union of the metal with the two scales or hafts on the back part of the pocket-knife handle.

WHITE, G. *An improved poultice.* (A communication.) Dated June 27, 1856. (No. 1520.)

A small bag is filled with tinder, agaric, or amadow, in a pulverised state, which imbibes any medicamental liquid required.

VINCENZI, E. *Improvements in Jacquard machines.* Dated June 28, 1856. (No. 1521.)

The object here is to facilitate the working of the machines and the reading of the patterns for looms worked by an electric current. The invention mainly consists in cutting out, by means of a metallic point, the outlines of each of the coloured spots of which the pattern is formed in a thin sheet of metal fixed to a sheet of pasteboard, thus isolating the outlines from each other, &c.

REID, R. *Improvements in the treatment or preparation of oils to be used in lubricating.* Dated June 28, 1856. (No. 1523.)

This invention consists in giving such oils an increased body, by dissolving gutta percha therein.

TRAVIS, E., and J. L. CASARTELLI. *Certain improvements in machinery or apparatus for testing or ascertaining the lubricating quality of oils or other unctuous substances.* Dated June 28, 1856. (No. 1524.)

This consists of mechanism for testing the lubricating quality of oils, &c., by means of the friction created between the internal surface of a conically-formed cup and the external surface of a corresponding cone, exactly fitting the shape of the cup.

BELLFORD, A. E. L. *Improvements in drying, burning and cooling bricks, tiles, and other ceramic substances.* (A communication.) Dated June 28, 1856. (No. 1527.)

The patentee describes certain ovens and drying chambers into and through which the bricks, &c., are passed on carriages running on rails, &c.

ORRELL, R., J. CLEMINSON, and W. BARRACLOUGH. *Improvements in steam boilers for preventing explosion thereof.* Dated June 28, 1856. (No. 1528.)

Inside steam boilers certain mechanism, in combination with a float, is so contrived that, when the level of the water is too high or too low, steam passes into the furnace, and blowing open the door gives notice, and either damps or puts out the fire. A steam gauge is also connected with the water float, for indicating the height of water in the boiler, in lieu of the ordinary water gauge. It is also proposed to arrange a safety valve within the boiler, having a weight attached equivalent to the desired pressure of the steam.

NEWTON, A. V. *An improved safety pocket for coats and other garments.* (A communication.) Dated June 30, 1856. (No. 1532.)

Garments are fitted with a metallic pocket, inverted so that it cannot be detached by any of the means ordinarily available by pickpockets.

BROWN, H., and J. BARTLETT. *The construction of an iron easy arm-chair bedstead.* Dated June 30, 1856. (No. 1533.)

The improved chair is so arranged that, as the back lowers, the back seat rises, until the back and front seat are in a straight line with the seat, and form a bedstead.

LUDFORD, W. H. *Improvements in the manufacture of brooms and brushes.* Dated July 1, 1856. (No. 1535.)

In fixing the bristles (or hair) the inventor makes a groove in the face of the head or stock, into which he runs the glue or pitch, and having arranged the bristles on a suitable plate or bar, over which another plate or bar can be laid, and clamped thereto, to hold the same temporarily, he inserts into each groove successively the entire quantity requisite to fill the same, and so on throughout, until each groove is similarly supplied. The ends of the heads may be closed with wood.

PROVISIONAL PROTECTIONS.

Dated December 26, 1856.

3064. Armand Jean Baptiste Louis de Marcescheau, of Paris, ancient consul general, chargé d'affaires. Improvements in the modes of communicating or transmitting motion to propelling apparatus, engines, or machinery.

Dated January 20, 1857.

169. Frederick Walton, of Haughton Dale Mills, near Manchester, card-manufacturer. An improved plastic composition, and in the application of machinery for manufacturing the same.

Dated February 11, 1857.

397. John Talbot Pitman, of Gracechurch-street, London. Improvements in the mode of making metallic hames for horses. A communication.

398. John Talbot Pitman, of Gracechurch-street, London. An improved system of working metallic ores and their products, both metallic and mineral. A communication.

400. William Todd and Jacob Todd, of Heywood, Lancaster, spinners and manufacturers. Certain improvements in power looms for weaving.

401. William George Armstrong, of Newcastle-upon-Tyne, civil engineer. Improvements in ordnance.

402. Richard Dugdale Kay, of Accrington, Lancaster, manufacturer. An improved method of using or applying a certain coloring matter, either singly or in combination with other coloring matters, to woven or felted fabrics, yarns, or threads, either in the white or dyed state. A communication.

403. John Poole, of Riley-street, Chelsea, engineer. Improvements in safety or other valves, and in mechanical appliances thereto.

404. John Macintosh, of Euston-square. Improvements in the manufacture and discharge of projectiles.

405. James Saul Hendy, of Essex-street, Strand, butler to the Honourable Society of the Inner Temple. Improvements in chimney-tops or cowls.

406. George Chappellpotts, of New Oxford-street, cooper. Improvements in cleansing casks.

Dated February 12, 1857.

407. Joshua Horton, jun., of Brierley-hill, Stafford, manufacturer. New or improved machinery for regulating the generation and pressure of steam in steam boilers, and for preventing the explosion of steam boilers.

408. John Langford, of Birmingham, manufacturer, and Joseph Wilder, of Birmingham, pyrotechnic artist. A new or improved signal and alarum.

410. Peter Hubert Desvignes, of Lewisham, Kent. Improvements in machinery for preparing flax, hemp, and other fibrous materials.

411. David Baker, of the Gisbro' Alum Works, Yorkshire. Improvements in the manufacture of compounds of alumina and of magnesia.

413. William Wilkins, of Camberwell, Surrey, builder. Improvements in flushing apparatus.

414. Isaac Blackburn, of Islington, Middlesex, engineer, and Robert Blackburn, of Edinburgh, engineer. Improvements in engines or implements to be employed in agriculture, applicable also to the transporting of heavy bodies, to the traction of carriages, and to the conveyance of passengers.

415. Edward Maynard, of Brooklyn, New York, U. S. A. An improvement in calks for the shoes of animals.

416. William Edward Newton, of Chancery-lane, civil engineer. Improved machinery for turning articles of irregular forms in the direction of their length. A communication.

418. Elias Bowcock, of Manchester, manager. Certain improvements in the manufacture of cords to be used in skirts and petticoats.

419. George Gimson, of Staley Bridge, Lancaster, engineer. Certain improvements in steam engines.

420. Thomas Wingate, of Glasgow, engineer. Improvements in screw propellers, and in adjusting the same.

Dated February 13, 1857.

421. Charles Wye Williams, of Liverpool, gentleman. Improvements in increasing the draught and promoting the combustion of the fuel in furnaces.

423. William Harry Harrison, of Ty Mawr,

Ponty Pridd, Glamorganshire, engineer. Certain improvements in the machinery or apparatus as at present employed for raising water from mines.

424. William Richardson, of Ranelagh-grove, Pimlico. Improvements in the use of iron or any other metal by itself or in combination with other materials for structural purposes.

425. Frederick Henry Sykes, of Cork-street, Piccadilly, esquire. An improved apparatus for supplying or feeding boilers with water, applicable to raising and forcing liquids for other purposes.

426. D. A. Lamb, of Berwick-upon-Tweed. Improvements in water-closets, and in apparatus connected therewith.

427. William Stettinius Clark, of High Holborn. Improvements in machines for grating substances. A communication.

428. Walter Sandell Mappin, of Birmingham, manufacturer. A new or improved method of constructing doors and windows, for the prevention of burglary, which method of construction is also applicable to other articles where strength is required.

429. Noel Clayton Smith, of Churton-street, Pimlico, clerk. Improvements in the disc engine.

430. Marmaduke William Hallett, of St. George's-road, Eccleston-square. Improvements in apparatus for securing window and other openings in buildings.

431. John Lawson and Stephen Cotton, of Leeds. Improvements in machinery for roving, spinning, or twisting flax, cotton, wool, and other fibrous substances.

433. Richard Houchin, jun., of Bridport-place, New North-road, Hoxton, engineer. Improvements in alarums.

434. Titus Robottom, of Atherstone, Warwick, engineer. Improvements in locomotive engines chiefly adapted for the purposes of common road or street traction, and the working of agricultural implements.

435. James Cocker, of Liverpool, wire-drawer. Improvements in, and apparatus for, the manufacture of wire, part of which improvements is applicable to the annealing of other metallic articles.

436. John Williams, of Port Madoc, Carnarvon, North Wales, ship-smith. Improvements in apparatus for lowering and stopping anchor chains on board ships, and for other similar purposes.

Dated February 14, 1857.

437. Andrew Barclay Walker, of Liverpool, wine and spirit merchant. An improved apparatus for heating fluids.

438. Hamilton Henry Fulton and Thomas Bodley Etty, both of Great Queen-street, Westminster. Improvements in the generation and application of steam power for propelling, hauling, driving, or conveying, particularly applicable to farming purposes.

439. Alexander Forrest, of Birmingham, gentleman. Improvements in the construction and ornamentation of belt or band fastenings and other dress fastenings.

440. John Cruikshank, of Princes-end, near Tipton, Stafford, roller. An improvement or improvements in rolling iron and steel wire.

441. Josiah Firth, of Flush Mills, Heckmondwike, York, manufacturer, and Joseph Crabtree, of Mill Bridge, in the same county, machine-maker. Improvements in power-looms for weaving fancy goods.

442. Archibald Smith, of Princes-street, Middlesex, engineer. Improvements in machinery for the manufacture of wire rope and other ropes.

443. James Taylor, of Upper-street, Islington, chemist. Improvements in the preparation or manufacture of manures.

444. Charles Robert Moate, of Old Broad-street, London, metal broker. Improvements in the permanent way of railways.

445. William Cooke, of Cornhill, London. Improvements in apparatus for ventilating.

Dated February 16, 1857.

447. William Robinson Jackson, of Baltimore, U. S. A. An improved railway-break.

449. John Crawley, sen., of Wood-street, Cheapside, collar-manufacturer. Improvements in collars and wristbands.

451. William Edward Wiley, of Great Hampton-street, Birmingham, pen and pencil manufacturer. Improvements in the manufacture of metal pens and pen-holders.

455. William Clark, of Chancery-lane, engineer. Improvements in the manufacture of railway chairs. A communication.

Dated February 17, 1857.

457. Henry Green, of Liverpool, whitesmith and ironmonger. An improved stove to be heated by gas.

459. John Goodman, gentleman, of Pall Mall. Improvements in apparatus for holding together letters, music, and other loose sheets. A communication.

461. John Bennett, of Birmingham, press tool-maker. A new or improved joint for fishing-rods, the rods or handles of parasols, and for other rods.

463. Emile Alcan, of Fore-street, London, merchant. Improvements in machinery for twisting, doubling, and spinning cotton, silk, and other fibrous materials. A communication.

465. Jean Baptiste Pascal, of Lyons, France, civil engineer. An improved engine with rotary piston applicable to various purposes.

467. Frederick Burnett Houghton, of Upper Gloucester-place, Dorset-square. Improvements in the preparation of materials used in the manufacture of paper.

469. William Young, of Queen-street, London, vesta lamp manufacturer. Improvements in fire-places or stoves.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," March 3rd,* 1857.)

2448. T. Flockton. Improvements in the consumption of smoke.

2449. C. Humfrey. Improvements in the manufacture of grease for lubricating railway axles and other machinery.

2457. J. T. Forster. Improvements in the symbols used in signalling.

2458. J. G. Jennings. Improvements in the construction of wall caps, sleeper blocks for the basements of buildings, and bricks to be used as substitutes for wood bricks in building.

2461. W. Parsons. Improvements in generating and employing steam in steam engines.

2470. W. Smith. Improvements in water level and pressure indicators and lubricators. A communication.

2484. T. Gray. An improved drying apparatus.

2488. J. Macdonald. Improvements in regulating the supply of oil or other liquids, applicable to lamps, gas-meters, and other useful purposes.

2490. A. D. Bishop. Improved apparatus for facilitating the finding and raising of vessels and submerged articles.

2491. T. Horrex. Improvements in fastening buttons and other similar articles on to garments and other things.

2503. H. A. Holden. Improvements in furniture for railway and other carriages, and which said improvements are also applicable as a means of finishing or ornamenting the iron parts of harness

and other articles made of iron, to which such mode of finishing or ornamenting has not heretofore been applied.

2507. G. Ernst and W. Lorberg. An improved mode or method of raising or producing designs, patterns, or impressions, on the surfaces of plates, blocks, or rollers, and transferring or imparting the same to paper, parchment, woven fabrics, leather, or other similar material.

2508. W. Benson. Improvements in apparatus for drying grain, seeds, and other substances.

2511. G. H. Bachhoffner. Improvements in glass shades for gas and other artificial lights.

2513. H. F. Osman. An improved contrivance for distending the skirts of ladies' dresses, and preserving the required form and shape thereof. A communication.

2529. W. A. Gilbee. Improvements in the construction of smoke-consuming furnaces. A communication.

2530. J. Armstrong. Improvements in the permanent way of railways.

2533. A. Aubril. The novel application of a certain root to the manufacture of starch, paper, and cardboard.

2546. F. Whitaker. Improvements in apparatus for supplying water to steam boilers.

2551. C. J. B. Torassa. An apparatus for calculating the speed of vessels at sea, as well as obtaining the extent of their destination caused by the side winds.

2557. J. Lawson. Improvements in the manufacture of pile and other fabrics.

2569. J. C. Sinclair. Improvements in treating, preparing, and drying agricultural produce.

2612. C. Hunter. Improvements in effecting the operations of drying, heating, and ventilating.

2622. W. Spence. Improvements in apparatus used in the manufacture of silk and other fibrous materials. A communication.

2706. J. Billing. Improvements in chimneys.

2793. H. Bougleux. Improvements in the construction of steam boilers.

2844. J. C. Ramsden. Improvements in apparatus or the mechanism of looms for weaving a certain class of plaids, checks, and fancy woven fabrics.

2942. F. W. Anderton and J. Beanland. Improvements in apparatus or means in connection with furnaces to facilitate the consumption of smoke.

3002. C. Fay. Improvements in railway carriages and breaks.

3023. W. J. Payne. Certain improvements in casting and finishing cocks for general purposes.

50. H. Bougleux. Improvements in steam boilers.

88. J. Chanter and J. Wakefield. Improvements in the fire-boxes or furnaces of locomotive engine-boilers.

160. F. Walton. An improved plastic composition, and in the application of machinery for manufacturing the same.

167. T. Johnson. An improvement in purifying alkaline lees.

183. T. Harris. Improvements in apparatus for refrigerating or cooling and regulating the temperature in worts and beer, which may also be employed as condensers in distilling.

188. F. A. N. Delsarte and E. Valin. Improvements in pianos and other stringed musical instruments.

271. J. Thom. Improvements in the construction and mode of fixing artificial teeth.

314. G. White. Improvements in dyeing and printing textile fibres and fabrics. A communication.

319. J. Hamaher. Improvements in the manufacture of blacking for polishing, softening, and preserving boots and shoes and other leathern articles.

328. J. H. Johnson. Improvements in the treatment of flax and similar textile materials. A communication.

348. N. Nomico and G. Heyes. Improvements in looms.

360. R. A. Brooman. An improved method of obtaining motive power. A communication.

370. L. Talabot. Improvements in the manufacture of iron and steel.

388. T. F. Johnson and J. Williams. Improvements in screw gill machinery for preparing wool and other fibrous materials.

404. J. Macintosh. Improvements in the manufacture and discharge of projectiles.

414. I. Blackburn and R. Blackburn. Improvements in engines or implements to be employed in agriculture, applicable also to the transporting of heavy bodies to the traction of carriages, and to the conveyance of passengers.

416. W. E. Newton. Improved machinery for turning articles of irregular forms in the direction of their length. A communication.

420. T. Wingate. Improvements in screw propellers, and in adjusting the same.

421. C. W. Williams. Improvements in increasing the draught and promoting the combustion of the fuel in furnaces.

435. J. Cocker. Improvements in, and apparatus for, the manufacture of wire, part of which improvements is applicable to the annealing of other metallic articles.

441. J. Firth and J. Crabtree. Improvements in power-looms for weaving fancy goods.

451. W. E. Wiley. Improvements in the manufacture of metal pens and pen-holders.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1854.

464. Charles Lamport.
477. Leontide Agalaše Pallegaix and Alexandre Louis Bellangé.
522. Caleb Bloomer.
524. William Vaughan and John Scattergood.
526. Charles Nightingale.
555. William Septimus Losh.
585. George Appolt and Charles Appolt.
696. William Wood.

LIST OF SEALED PATENTS.

Sealed February 24, 1857.

2052. Constant Jouffroy Duméry.
2080. Alfred Vincent Newton.
2186. Louis Jacquemier.
2236. Alfred Vincent Newton.
2414. George Collier.
2446. Jacques Félix Deshayes.
2890. Lodewyk Polak Kerdyk.
3060. Charles Sylvester Rostaing.
47. Louis Antoine Ritterbandt.

Sealed February 27, 1857.

1997. Thomas Lees.
2023. John Gregory.
2029. Richard Hill Norris.
2039. George Cummin Thomas.
2041. Jean Baptiste Marcelin Jobard.

2044. Louis Cornides.
2053. Joel Tanner Hart.
2064. John Benjamin Dancer.
2083. Peter Armand Lecomte de Fontainemoreau.
2093. Francis Mitchell Herring.
2100. William Gossage.
2142. Edward Green.
2166. Richard Archibald Brooman.
2177. William Frederick Spittle.
2225. John George Taylor.
2328. Alfred Vincent Newton.
2343. James Hinks.
2350. William Ward.
2422. John Green.
2476. William Edward Newton.
2797. John Marshall.
2941. George Collier.
2977. Edwin Heywood.
3056. Jules Henry Etienne Mareschal.
3103. Charles Wye Williams.
46. Thomas Holmes.

Sealed March 3, 1857.

2054. Evan Leigh and George Peter Leigh.
2059. John Montagu Hayes.
2061. John Loude Tabberner.
2066. John Johnston.
2072. John Johnston.
2088. Adolphe Gilbert Chalus.
2092. Boniface Sabatier.
2095. William Petrie.
2106. Henry Cooke.
2122. John Gedge.
2126. John Milnes and William Thompson.
2147. Frederic Ducimetière-Monod.
2159. Stanislas Chodsko.
2253. Samuel Calley.
2258. William Horsfall.
2555. Louis Urion.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine*, must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

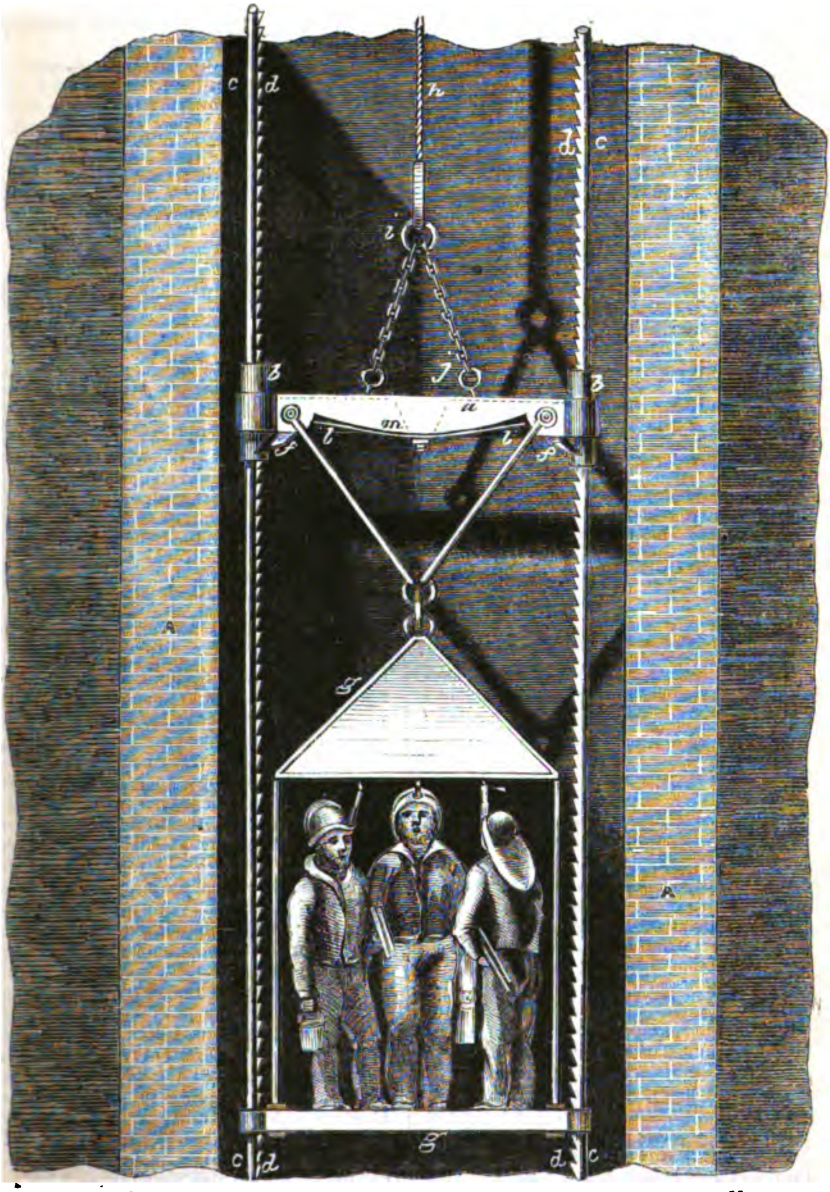
Mechanics' Magazine.

No. 1753.] SATURDAY, MARCH 14, 1857. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

SIMPSON'S SAFETY APPARATUS FOR MINE CAGES.

Fig. 1.



SIMPSON'S SAFETY APPARATUS FOR MINE CAGES.

MR. EDMUND SIMPSON, of Preston, has patented an apparatus to be attached to mine cages, to prevent their falling, in the event of the rope by which they are suspended breaking. This apparatus consists of a cross tree, having at each end an eye or clasp, which slides loosely over guide rods, furnished with ratchet teeth, and extending from the top to the bottom of the shaft. The cross tree has clicks or pawls fitted close to the eyes or clasps, and so arranged that, in the event of the rope breaking, the clicks are forced by springs into the ratchet teeth on the inner faces of the guide rods, thereby instantly arresting the descent of the cross tree, and the cage attached to it.

The accompanying engravings represent the improved apparatus. A A, fig. 1, are the sides of the shaft. *a* is the cross tree; *b b* are the eyes or clasps; *c c*, the guide rods; *d d*, the ratchet teeth; *f f*, the clicks or pawls; *g g*, the cage; and *h*, the lowering rope. The rope, *h*, is attached to a link, *i*, carrying two chains, the other ends of which are connected to two eyes, *j j*, formed upon levers or plates, *k k*, represented separately in the plan, fig. 2, and the side view, fig. 3. These levers, *k k*, are fitted between the two plates of the cross tree,

Fig. 4. Fig. 2.

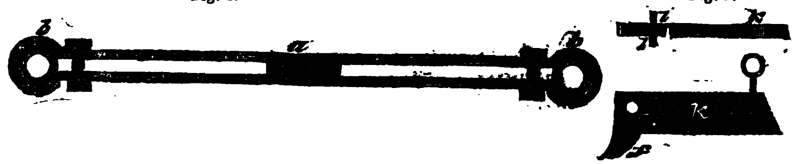


Fig. 3.

shown in plan in fig. 4. These levers also carry the clicks, *f f* (which are part of them), and the pins, *l l*, upon which the ends of the spring, *m*, act. Should the rope, *h*, break, the spring, *m*, presses down the pins, *l l*, and therefore the levers, *k k*, throwing the clicks, *f f*, into the ratchet teeth, *d d*, which instantly receive and sustain the weight of the cage, with its contents and its appendages, preventing their descent into the mine, and retaining them until the necessary repairs are effected. The patentee sometimes suspends the cage from the cross tree by means of a spring hook, constructed with alternate plates of metal and India rubber, to prevent sudden jerks upon the rope in starting the cage upwards, or otherwise. The patent of Mr. Simpson also embraces various modifications of the above apparatus.

THE AMERICAN NAUTILUS:

MAJOR SEARS' APPARATUS FOR SUBMARINE ENGINEERING AND EXPLORATION.

THE American scientific journals have recently contained numerous accounts of a submarine apparatus called a "Nautilus," the invention of Major H. B. Sears, of which they have spoken very highly. A description of this apparatus was read at the Society of Arts, on Wednesday, March 4.

It appears that the "Nautilus" is entirely independent of suspension; its movements are entirely dependent on the will of those within it, and without reference to those who may be stationed without; it possesses the power of lifting large weights, *per se*, and at the same time is perfectly safe, by common care, in its operations.

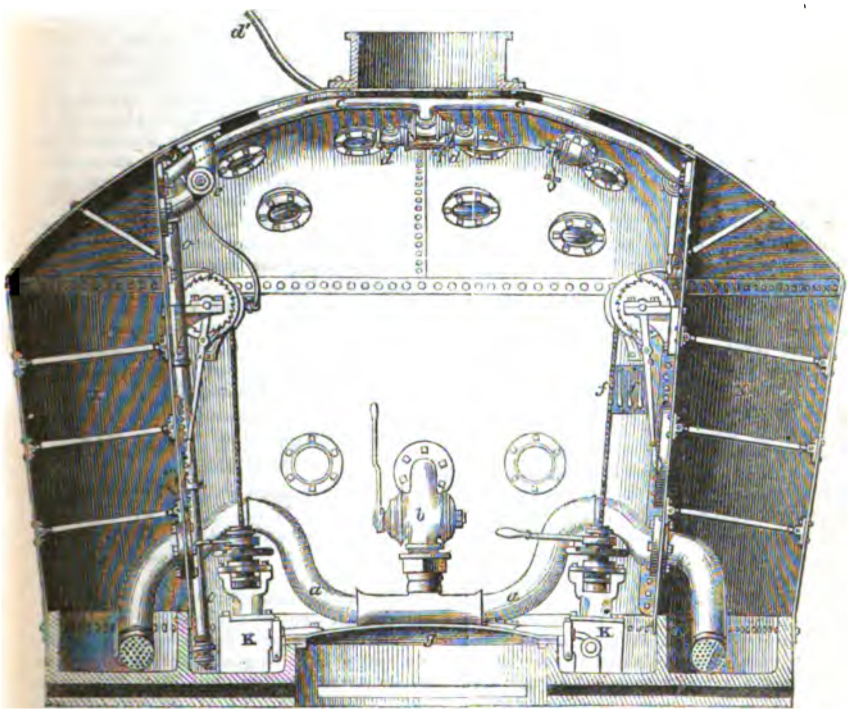
The form of the machine is not arbitrary, but depends entirely on the nature of the work to be performed, adapting itself to the various circumstances attending any given position. By reference to the annexed diagram it will be perceived that when at rest, being entirely enclosed, its displacement of water being greater than its own weight, it must float at the top of the surface. Entering through a man-hole at the top (which is closed either from the inside or outside), you descend into the interior of the machine, portions of which are walled off on either side, forming chambers; these chambers are connected at or near the bottom by a pipe, *a*, *a*, which opens by a cock, *b*, outwards to the external surrounding water. An opening in the bottom of the machine of variable dimensions is closed by a door or doors, susceptible of being opened or closed at pleasure. The chambers, X, X, are likewise connected at top by a smaller pipe, *c*, *c*, which opens through the top of the machine, and to which opening is affixed a flexible pipe, with coils of wire spirally enclosed. Branches on this latter pipe, *d*, *d*, allow also communication with the larger or working chamber.

At the surface of the water, placed on a float or vessel for the purpose, is a receiver of variable dimensions, to which is attached at one end a hollow drum or reel, to the barrel of which is affixed the other end of the flexible pipe, *d'*, leading to the top of the Nautilus. At the other end of, and in connection with the receiver, is a powerful steam air-condensing pump. This combination represents the Nautilus machine as adapted to engineering work.

Modus Operandi.—The operator, with his assistants, enters the machine through the

top, which is then closed. To descend, the water-cock, *b*, is opened, and the external water flows into the chambers, X, X; at the same time a cock, *e*, on a pipe opening from the chambers outwards, is opened, in order that, the air escaping, an uninterrupted flow of water may take place into the chambers. The assumption of weight of water causes a destruction of buoyancy due to displacement by the mass itself, and the Nautilus gradually sinks. As soon as it is fairly under water, in order that the

Sectional view of the Nautilus Machine.



descent may be quiet and without shock, the water-cock, *b*, is closed. The receiver at the surface, being previously charged by the air-pump to a density somewhat greater than that of the water at the depth proposed to attain, one of the branch cocks on the pipe, *c*, *c*, connecting the chambers at top, is opened, and the air rushes into the working chamber, gradually condensing until a density equal to the density of the water without attained; this is indicated by proper air and water gauges, *f*, *f*. These gauges marking equal points, showing the equilibrium of forces without and within, the covers to the bottom, *g*, *g*, are removed or raised, and communication is held with the bottom on which the Nautilus is resting. In order to move about in localities where tides or currents do not affect operations, it is only necessary to step out of the bottom of the Nautilus, and placing the hands against its side the operator may move it (by pushing,) in any direction. Where currents or tides, however, have sway, it becomes necessary to depend upon fixed points, from which movements may be made in any direction. This is accomplished by placing in the bottom of the Nautilus stuffing boxes of peculiar construction, K, K, through which cables may pass over pulleys to the external side, thence up through tubes (to prevent them from being worn,) to and over oscillating or swinging pulleys placed in the plane of the centre of gravity of the Nautilus, and thence to the points of affixment respectively. The object to be gained by having the swinging pulleys in the plane of the centre of gravity of the mass, is to hold the machine steady and to prevent oscillation. Within the machine, and directly over the above stuffing boxes, are windlasses for winding in the cables.

By working these windlasses movement may be effected, and of course the number of these cables will depend on the variable character of the situation to be occupied. Having thus secured the means of descending, communicating with the bottom, and of movement, the next point is to ascend. Weight of water has caused a destruction of buoyancy at first, and consequent sinking; if, then, any portion of this water is removed, an upward effort will at once be exerted, exactly proportionate to the weight of water thrown off. The air in the receiver at the surface being constantly maintained at a higher density than that of the water below, if we open the water-cock, *b*, and at the same time open the cock on the top pipe, *c*, *c*, throwing the condensed air from the receiver above directly on to the surface of the water in the chambers, movement and consequent expulsion of the water must take place, and an upward movement of the machine itself, which will rise to the surface.

If, previously to the expulsion of the water, the Nautilus be affixed to any object below, the power exerted on that object will be exactly proportionate to the weight of water expelled, and the power will continue increasing, until there being no further weight to be thrown off, the maximum effect is produced. To apply this power to lifting masses of stone or rock, proper arrangements are affixed to the centre of the opening in the bottom, by which connection can be made with the weight, admitting at the same time the swinging around of the object suspended, so that it may be placed in any required position. In the construction of permanent works, or the movement of objects whose weight is known, or can be estimated, a water or so-called lifting tube is placed on the side of the water chamber which indicates the lifting power exercised by the Nautilus at any moment. The advantage of this gauge will be recognised, inasmuch as without it the closest attention of the operator working very cautiously, would be necessary to determine when the weight was overcome; by its aid, however, the operator boldly throws open all the valves necessary to develop the power of the Nautilus, watching only the gauge. The water having reached the proper level indicating the required lifting power, he knows the weight must be overcome or so nearly so that the valve or the cocks may be at once closed, in order that the movement may take place horizontally. If there were not an index of this character, carelessness or inattention on the part of the operator, by leaving the cocks open too long, might develop a power greater than required, and the Nautilus would start suddenly upward. For many months the difficulties attending the upward tendency of the machine, under such circumstances, baffled all attempts at control. A weight attached could be lifted, but the instant it was entirely suspended, before the valves could be closed, upward movement was communicated entirely beyond control. This difficulty, so fatal, has been overcome by an arrangement of the bottom of the Nautilus with channels, which radiate from the opening in an inclined direction, debouching at the sides of the machine. The moment, then, that the air, by its expansion from diminished resistance, or by the introduction from above of a greater volume than can be sustained by the water below, reaches, in its downward passage, the level of these chambers, following the direction of least resistance, it passes through these channels and escapes into the surrounding water, without of course affecting the movement of the machine in the least.

A very interesting and important discussion, turning chiefly upon the character of earlier submarine apparatuses, followed the reading of the paper, and is reported in the Society's *Journal* of March 6.

CLAY RETORTS FOR GAS-MAKING.

At the Institution of Civil Engineers, on the evening of March 3, a paper was read "On the Results of the Use of Clay Retorts for Gas-making," by Mr. Jabez Church, Assoc. Inst. C.E.

The substitution of fire-clay for metal, in the construction of retorts, was attributed to Mr. Grafton, and dated back as far as the year 1820. Originally they were square in transverse section, but that form was soon changed for the D, or oven-shape, which had been since adhered to, both in this country and abroad; this latter form of retort admitting of a stratum of coal being distributed of an equal thickness throughout.

The comparative quantities of gas made by iron and clay retorts of the D form, of 15 inches by 13 inches in section, and 7 feet 6 inches in length, had been found by the Author to be as follows:—

The iron retorts lasting 365 days, and working off 1½ cwt. of coal for each charge, effected the carbonization of 2,190 cwt. of coal, which at 9,000 cubic feet of gas per ton, gave a total quantity of 985,500 cubic feet of gas per retort; whilst the clay retorts lasted 912 days, carbonized 5,472 cwt. of coal, which, at 9,000 cubic feet of gas per ton, gave 2,462,400 cubic feet of gas per retort. It would thus be seen, that the clay retorts yielded a greater quantity

of gas from the same weight of coal, than the iron retorts, but the specific gravity of the gas so made was less, and its illuminating power was diminished, in consequence of the increased temperature of the clay retorts, which caused the last portion of the gas to be decomposed.

The most practical method of working clay retorts in large works, was with the addition of an exhauster. This reduced the pressure on the retort, and prevented the escape of gas through the pores and fissures; and by that system the quantity made was increased about 200 cubic feet per ton of coal. In small works, the expense of an exhausting apparatus, and steam machinery to work it, would not be compensated by the gas saved. In such cases, therefore, it was necessary to work at as low a pressure as possible; and it had been found that a water gauge pressure of seven inches was the most profitable. The deposition of carbon from the decomposition of gas at a high temperature, was more abundant in clay than in iron retorts, and it had been determined, experimentally, that its amount was also influenced by the particular kind of clay used, as well as by the smoothness or roughness of the interior surface of the retorts, the deposition being greatest in the latter case. The principal portion of carbon appeared to separate from the gas at the earlier period of working the charge of coal, and ceased to be separated towards the latter part of the time; so that every time the retorts were charged and worked, there was a distinct layer of carbon thus formed, and eventually this accumulation became so great, that it required to be removed. The removal of this carbonaceous incrustation, on account of the fragile nature of the clay retorts, required to be conducted very carefully. In the ordinary way atmospheric air was introduced into the retort for from nine to thirty hours, and then the carbon was detached by means of chisel-ended bars. The Author had tried the plan of inserting an earthenware pipe through an orifice in the lower part of one of the lids, the inclination of the pipe being changed, so as to allow the air entering through it to impinge successively on every part of the carbonaceous mass; being, at the same time, a temporary connection made between the ascending pipe leading to the hydraulic main and the main flue of the retort stack leading to the chimney shaft. By this method only half the time was needed for the removal of the carbonaceous incrustation.

With respect to the quantity of fuel required for carbonising the coal, it had been found, that with short retorts the results were about the same, whether clay or iron retorts were used. In ordinary working, about 25 to 30 per cent. on the quantity of coke made was consumed, assuming that Newcastle coal was used, and that a chaldron of coke was produced by each ton of coal. With clay retorts of 20 feet in length, a saving of fuel was effected.

In conclusion, the author stated that the cost of clay retorts was about 50 per cent. less than that of iron retorts, and that there was a saving of about 20 per cent. in the setting, whilst their durability in work was two and a half times greater, the former lasting two and a half years, and the latter only one year.

In the discussion, which followed the reading of Mr. Church's paper, the general results given by him were confirmed.

It has been observed, that instead of following the usual law, the leakage of gas through the pores, or fissures of the clay retorts was exactly as the pressure, instead of as the square of the pressure.

The circumstances under which the bi-sulphuret of carbon was evolved were treated of at some length, and it was shown that even the method now adopted of leaving in the gas a small portion of ammonia, was not entirely effectual in removing the prejudicial effect of the bi-sulphuret of carbon, which was so severely felt in the rooms where gas was burned.

It was stated that the carbonaceous deposit in the retorts could be more speedily removed by the use of a small quantity of salt thrown in when in a heated state. It was very important that the interior surface should be as smooth as possible, to reduce the tendency to deposit, which was believed to proceed from the tar produced in the process of destructive distillation of the coal, rather than from the gas. The use of clay retorts was admitted to be now almost universal, except in very small gas-works, and that the economy they induced was even greater than had been stated in the paper.

A MOUNTAIN TOP RAILWAY.

A pamphlet by Mr. Charles Ellet, jun., Chief Engineer of the American Central Railroad Company, and the author of a work on the "Deltas of the Ohio," came recently to hand, giving a description of a railroad across the Blue Mountain Ridge, at Rock Fish Gap, in the State of Virginia.

Mr. Latrobe, the able engineer of the Baltimore and Ohio Railroad, was the first to carry railroads *over* great elevations, when he passed his engines and trains over the mountains in anticipation of the completion of the Kingwood and Broad Tree Tunnels.

The writer of the pamphlet referred to, in face of energetic professional opposition, has successfully applied the same system in Virginia, and thinks its application may be judiciously extended to many other works. He does not, however, advocate such roads for temporary use only. On the contrary, he is convinced that there are many points where roads of very high grades—grades of

200 feet, or, in extreme cases, more than 300 feet per mile—may be justifiably introduced for permanent use. The Mountain Top Track crosses the summit of the Blue Ridge at Rock Fish Gap, where the elevation of the mountain is 1,885 feet above tide. The crest of the ridge is very narrow, and is passed on a curve of 300 feet radius. There is barely room for an engine with an ordinary train to stand on the summit, before the road slopes off, descending both towards the east and west, to the valleys on either side of the ridge. The length of the descent on the western side, from the summit to what is here assumed to be the foot of the mountain, is 10,650 feet, or $2\frac{2}{100}$ miles. The track descends in this distance, on the west side, 450 feet—or, at the average rate of one foot in $23\frac{2}{3}$ feet. The *average grade* on the western slope is, therefore, $223\frac{1}{10}$ feet per mile. The *maximum grade* on the western slope is $5\frac{3}{10}$ feet in 100, or $279\frac{84}{100}$ feet per mile. On both sides of the mountain the ruling curves are described with a radius of 300 feet, on which the grade is $237\frac{6}{10}$ feet per mile. But the more difficult portion of the work was on the eastern side of the mountain, where the ascent was greater, and the slope, in order to reach a certain level, which became a necessary condition of the problem of location, was required to be greater. The length of the line of descent from the summit to the foot of the grade, is 12,500 feet, or $2\frac{37}{100}$ miles. The road descends in this distance 610 feet, or at the average rate of one foot in $20\frac{1}{2}$ feet. The *average grade* on the eastern slope is, therefore, $257\frac{7}{10}$ feet per mile. The *maximum grade* on the eastern slope is $5\frac{6}{10}$ feet in 100, or $295\frac{68}{100}$ feet per mile. This maximum grade is found in a continuous line of half a mile in length. The shortest radius of curvature on this side of the mountain was intended to be 300 feet; but in the construction of the work a more abrupt curve was introduced at one difficult point, in order to throw the track further into the hill and keep the embankment off a face of sloping and treacherous rock. At this ravine, which is found about half way down the mountain, the radius of curvature is only 234 feet, and the grade upon that curve is $237\frac{6}{10}$ feet per mile. This road was opened to the public in the spring of 1854, and it has now, in the spring of 1857, been in constant use for a period of nearly three years. In all that time the admirable engines relied on to perform the extraordinary duties imposed upon them in the passage of this summit, have failed *but once* to make their regular trips, and then the train was caught in a snow-drift near the summit of the mountain. The locomotives mainly relied on for this severe duty are mounted on six wheels, all drivers, and coupled, and 42 ins. diameter. The wheels are set very close, to reduce the difficulty of turning the short curves of the road. The diameter of the cylinders is $16\frac{1}{2}$ ins.; and the length of the stroke 20 ins. To increase the adhesion, and, at the same time avoid the resistance of a tender, the engine carries its tank upon the boiler, and the footboard is lengthened out and provided with suspended side boxes, where a supply of fuel may be stored. By this means the weight of wood and water, instead of abstracting from the effective power of the engine, contributes to its adhesion and consequent ability to climb the mountain. The total weight of these engines is 55,000 pounds, or $27\frac{1}{2}$ tons, when the boiler and tank are supplied with water, and fuel enough for a trip of eight miles is on board. The capacity of the tank is sufficient to hold 100 cubic feet of water, and it has storage room on top for 100 cubic feet of wood, in addition to what may be carried in the side boxes and on the footboard. In conveying freight, the regular train on the mountain is three of the eight-wheel house cars fully loaded, or four empty or partly loaded. These three cars, when full, weigh with their loads from 40 to 43 tons. Sometimes, though rarely, when the business has been unusually heavy, the loads have exceeded 50 tons. The ordinary speed of the engines, when loaded, is $7\frac{1}{2}$ miles an hour on the ascending grades, and from $5\frac{1}{2}$ to 6 miles an hour on the descent. Greater speed and larger loads might doubtless be permitted with success; but the policy has been to work the track with perfect safety, to risk nothing, and to obtain and hold the public confidence.

Reports of Experiments on the Strength and other Properties of Metals for Cannon. Philadelphia: Baird. London: Trübner.

THE bursting of the large gun on board the *Princeton* American war steamer, thirteen years ago, caused the United States Government to institute a series of investigations on the properties of metals for cannon, a detailed report of which, so far as prosecuted, is contained in the volume before us.

The portion of the volume allotted to wrought iron is limited to a brief inquiry on the tensile strength of the iron in the unfortunate gun alluded to. This resulted in the discovery, that while the metal bore only one-third the strain of English bars of average quality, portions of it, when reworked, stood a tensile force nearly equal to that borne by the best hammered iron of

American make. No explanation of the cause of this inferior tensile strength in the large mass appears in the report, which, in this respect, must be held deficient.

The experiments on the tensile strength and specific gravity of the metal (American) in cast-iron ordnance are exceedingly numerous, and appear to have been conducted with great care. The plan pursued with all new ordnance seems worthy of imitation by engineers generally, when manufacturing castings in which a high tensile strength is demanded. Pieces of metal were taken from the gun head, as fairly representing the quality where the casting had been effected with a single charge, and turned in a lathe to the section and size fitting the testing machine. A record of the strain borne by the trial piece of each gun was kept, and forms the substance of the report. Whenever the tensile strength fell below 20,000 lbs. the square inch, the quality was pronounced bad, and the gun unfit for service.

The effect of remelting the iron is shown in an augmentation of the specific gravity from about 7·000 to 7·320, and an increase in the tenacity from 20,000 lbs. to 38,000 lbs. the square inch. Although in an extensive series of experiments one or two exceptions are to be found, the dependence of superior tensile properties on a high density of the metal is very well borne out, and confirms the correctness of the views advanced by several English experimenters. But for the attainment of this high tensile strength, the iron requires to be remelted twice, and in some instances three times. An equally great improvement, however, is obtained through keeping the iron in fusion for longer periods than usual. Thus pig iron remelted and 15 minutes in fusion bore a strain of 20,336 lbs; the same iron 2½ hours in fusion 27,456 lbs.; 4½ hours in fusion 29,227 lbs.; 6¾ hours 36,312 lbs.; and 7¾ hours 37,552 lbs. the square inch. The density rose from 7·175 in the first to 7·343 in the last experiment.

These figures are corroborative of the opinion expressed by Mr. Truran in "The Iron Manufacture of Great Britain," that mere exposure to a reverberating column of hot air, either by repeated fusions, or by a prolonged exposure, results in a refining of the molten iron through the combustion of the carbon, and partial separation of the alloyed matters. The process, however, is applicable only to dark gray varieties of pig iron; bright gray pigs bear only a limited exposure, and though their density is increased to 7,400 by lengthening the refining, their tenacity suffers a large diminution.

Some few experiments appear to have been made on the comparative strength of iron in large castings slowly cooled, and small castings cooled rapidly. The tensile strength of the former was greatest; but tested with a transverse strain, steadily applied, the small casting, cooled quickly, had the advantage.

Several guns were subjected to hydraulic pressure; and it is worthy of remark that at pressures of 9,000 lbs. and upwards the water issued from the metal in innumerable fine jets, showing that in the metal of cast-iron guns a peculiar alteration of structure took place when subjected to this pressure.

In all the experiments, hot blast iron was found greatly inferior to cold, in point of density and tenacity; so much so that in some contracts, where hot blast iron had been used, more than one-half of the guns burst under the proof fire. In no instance did the hot air smelted metal approach the tenacity essential to the durability and safety of heavy ordnance,—a circumstance which led the American Government to prohibit its use in all subsequent contracts.

With a view of ascertaining the chemical composition of the irons exhibiting remarkable qualities, a series of analytical investigations are being made; but those hitherto made in connection with the reports must be looked on as of a preliminary and undecisive character.

A number of plates, showing the construction of the testing machines, and the fracture of the guns which gave way under severe firing, accompanies the reports. On the whole, it must be considered a work of great value to those engaged in the founding and use of iron ordnance. Our own Government, we observe, are about instituting similar experiments on the properties of English irons applicable to the manufacture of ordnance. It is to be regretted that instead of taking the initiative in an inquiry confessedly of national importance, they are found as mere copyists of the example set by the American Government. Were this the first occurrence of the kind, we should have passed it without remark; but it was only when the American Government had caused a thorough investigation of the qualities of American coals suitable for their steam navy, and the results had been published to the world, that our own Government ordered a similar inquiry to be made on English coals. Let us hope that a more enlightened policy will be adopted in future.

A Manual of Electricity: including Galvanism, Magnetism, Diamagnetism, Electro-Dynamics, Magneto-Electricity, and the Electric Telegraph. By HENRY M. NOAD, Ph.D., F.C.S., &c., &c. Fourth Edition, entirely re-written. Part. II., Magnetism and the Electric Telegraph. London: George Knight and Co., Foster-lane. 1857.

THE First Part of this edition of Dr. Noad's "Manual of Electricity" was noticed with well-merited favour in our sixty-third volume. The Second Part, now before us, deserves to be mentioned with equal commendation. It has the merit of placing before the reader descriptions of numerous instruments and apparatuses not previously made public, and of bringing together facts and investigations connected with electrical science which have not been elsewhere collected. It comprises four comprehensive chapters on magnetism, and others on electro-magnetism, magneto-electricity, the electric telegraph, diamagnetism, and magnetic hypotheses, and brings the investigation of each of these subjects down to a much later date than any other work.

It is, however, in some respects, important for it to be known, that several months have elapsed between the preparation of the principal portions of the work and its publication, and during that period some of the instruments described have been improved. Mr. Hearder's induction coil may be instanced as an example of this. Dr. Noad, after mentioning an opportunity which was afforded him of comparing Ruhmkorff's instrument with one of Mr. Hearder's, and giving a description of the latter, states that in experimenting with it, "The sparks between two platinum terminals followed one another with great rapidity through *five-eighths* of an inch *in air*, the primary wire being excited by four cells of Grove's battery." This is an insignificant result when compared with what Mr. Hearder has subsequently effected, as described in this Magazine, in December last.* As was there stated, sparks in air of more than an inch in length were obtained, many months since, with his small machine, which has a bobbin 6 inches long only; while with his larger machine, which has a 12-inch bobbin, the length of spark developed, with twelve cells of a nitric acid battery (the platina plates of which are 2 inches by 4 inches), is nearly 3 inches in free air, and more than 12 inches through the flame of burning alcohol. We mention these circumstances here because, from some observations which we heard Mr. Hearder make at the conclusion of his lecture at the London Institution, on the 22nd of February, we gather that he has experienced some annoyance, if not injury, from the delay in the publication of this work of Dr. Noad, for which Mr. Hearder supplied certain informatien about a year since. And it has further occurred to us that additional injury might result to Mr. Hearder, from the circumstance that this volume, which bears upon its title-page the date of 1857, apparently mentions, as the most recent developments of Mr. Hearder's coil, results which were far surpassed early in the year 1856. Dr. Noad, however, gives Mr. Hearder full credit for the originality and excellence of his improvements. He says (page 727): "About the same time" (1842, when M.M. Masson and Breguet constructed their coil) "Mr. Hearder, of Plymouth, constructed a powerful arrangement of primary and secondary wires, under the form of a medical instrument, for which, in September, 1846, he received the silver medal of the Royal Polytechnic Society of Cornwall. With this apparatus surprising electrical effects were produced; strong sparks were obtained *in air*, Leyden jars were charged, and a striking distance obtained of several inches through rarefied air." Again, in speaking of the more recently constructed coil, which he compared with Ruhmkorff's, he says (page 744): "When a Leyden jar, containing 3 square feet of coated glass, was interposed in the circuit of the secondary, a battery of 10 cells" (Grove's) "being employed, a remarkably sonorous and vivid discharge was maintained in an uninterrupted manner. The noise of the discharge was decidedly greater, and the light more voluminous and bright than with Ruhmkorff's instrument, similarly excited." And again: "In adapting the condenser to his induction coil, Hearder has been guided by considerations derived from a laborious course of experiments" (page 745). In an earlier portion of the work (page 684) is also given a very excellent description of Hearder's magnetometer, and an account of experiments performed with it, which we have not before met with.

We also meet in this volume a detailed description of Messrs. Bright's acoustic telegraphic apparatus, a brief account of which was given in our sixty-fourth volume.* Dr. Noad gives the following account of it: "Under the ordinary system of telegraphing, it is necessary to employ a transcriber to write down the words as in-

* See *Mech. Mag.*, No. 1740, for Dec. 13, 1856.

* See *Mech. Mag.* for May 3, 1856, No. 1708, p. 424.

terpreted from the visual signals, and dictated to him by the receiving operator, whose eyes being fixed on the rapidly moving needles, could not be engaged in conjunction with his hands in writing. It was found that, owing to the frequent occurrence of words of nearly similar sound, the transcribers sometimes unavoidably misunderstood the meaning of the receiving operators, and altered the sense of the despatch by writing the wrong word. Such words as "two," "too," "to," "four," "for," "hour," "our," may, for instance, be very easily confounded. Messrs. Bright have sought to remedy this inconvenience by transferring the manifestation of the effects of the current from the eye to the ear..... There are usually a pair of bells together, one bell differing half an octave in tone from the other, and one being fixed to a wooden partition, one on one side, and the other on the other side of the operator. From the number of beats, and the difference in tone, the letters and words are formed in the same manner as with the needle telegraph. Besides the saving in staff and in mistakes, any injury to the eyes of the clerks is prevented, and an appeal is made to an organ far better capable of endurance and accurate interpretation; and it is found that a greater speed can be attained than by the old plan of telegraphing by needles, and the prompt attention of the operator is at once directed to the instrument, by the sounds given upon a call being made. It is worthy of note, that while to read by a visible signal, a movement of at least the eighth part of an inch is necessary for accuracy, the local current of the acoustic apparatus produces the full sound by the slightest movement, even the $\frac{1}{100}$th part of an inch of the magnet actuated by the primary current proceeding from a distant station. ...... Some of the most busy circuits in connection with the English and Irish Magnetic Telegraph Company are now worked by this method, at the rate of from 30 to 40 words per minute, received and written down by the *same* operator."

We cannot conclude this notice of Dr Noad's volume without mentioning one very great blemish—the reproduction from Faraday's "Experimental Researches," without criticism or correction, of passages upon "Places of No Magnetic Action," and other subjects, which we, at least, have shown to be very defective. Indeed, Dr. Noad, although he deals somewhat warily with the speculations of Faraday, has clearly committed errors in his remarks upon them. For example, at page 866, he says: "In using this term, 'line of force,' Faraday intends to express *simply the direction of the force* in a given place, and not any physical idea or notion of the manner in which the force may be there exerted."

Now, this is plainly contradictory to what Faraday himself says, for (in a passage which we have before commented upon *) he states that "These phrases" ("magnetic curves, or lines of magnetic force") "have a high meaning, and represent the ideality of magnetism. They imply *not merely the directions of force*, which are made manifest when a little magnet, or a crystal, or other subject of magnetic action is placed amongst them; but those *lines of power which connect and sustain the polarities*, and exist as much when there is no magnetic needle or crystal there as when there is, having an *independent existence*, analogous to (though very different in nature from) a ray of light or heat." (*Lecture at Royal Institution, April* 11, 1851, and "Experimental Researches," vol. iii. p. 325.)

And, besides this, Dr. Noad himself, in another place (page 876), says: "That the lines of force are closed curves, passing in one part of their course through the magnet, and in the other part through the space around it, is proved by the moving wire, and the fact is considered by Faraday as implying that such lines have *a physical existence*."

Dr. Noad appears to be well able to exhibit the fallacy of Faraday's statements respecting these "lines of force"—which, from the nonsense that has been written about them, never appear to us to be the lines that fall in pleasant places—and we regret that he did not undertake the task.

Orr's Circle of the Industrial Arts. Nos. 1—14; Parts 1—3. London: Orr and Co., Amen Corner, Paternoster-row.

THE recent serial publications of Messrs. Orr have been remarkable for sterling merit, and there is not one of them which deserves greater commendation than this "Circle of the Industrial Arts." In the portion of the first volume now before us, we have treatises from the pens of Mr. W. Fairbairn, Mr. W. Truran, Mr. Scoffern, Mr. Wm. Clay, and other gentlemen who are justly held in esteem by men of science; and the articles themselves confirm the expectations which the names of the writers raise. They are manifestly the production of practical men, according to the profession of the publishers.

We must complain, however, of the irregular and defective manner in which this work has hitherto been issued, which interferes considerably with the connected study of the work—a very important interference to the

* See *Mech. Mag.* No. 1707, vol. lxiv., p. 387.

class of persons who are not likely to purchase it, and which, if not avoided hereafter, must tell seriously upon the sale of it. We are quite willing to believe that the evil has resulted from a desire on the part of the publishers to hasten its issue, but this circumstance cannot materially lessen the annoyance of purchasers. Unless we are mistaken, every possible precaution should be taken with such serials to facilitate the study of the reader, and everything tending to confusion avoided. Nor is the purchaser only affected, for we confess that from our inability to grasp the plan and scope of the work from what has already appeared, we are unable to do the publication that justice which we anticipate it will ultimately be seen to merit.

Apart from this irregularity of issue, however, the work is excellent, not merely as a compilation of known facts, but as a practical treatise upon the useful metals, and their application brought quite down to the present year.

GALVANISM AND ITS APPLICATIONS.

A committee has been formed in France, to examine and report on the merits of the competitors for the prize of 50,000 francs (£2,000 sterling), offered by the decree of the 23rd February, 1852, for the discovery of a means of rendering the galvanic battery commercially applicable in the arts, either as a source of heat or light, or as a mechanical power, or as a chemical or medical agent. The committee consists of MM. Dumas, President; Chevreul, Pelouze, Regnault, Despretz, Rayer, Serres, Charles Dupin, Séquier, Poncelet, Morin, Members of the Academy; Reynaud, Director of Lighthouses; and Henry Sainte-Clare Deville, of the Normal School.—*Journal of Society of Arts.*

NAPOLEON I. AND FULTON.

NAPOLEON has frequently been reproached with having coldly received Fulton and his plan for the application of steam to the purposes of navigation. Marshal Marmont, in his memoirs, says that Buonaparte, who, from his education in the artillery, had a natural prejudice against novelties, treated Fulton as a quack, and would not listen to him. M. Louis Figuier also, in pp. 258 *et seq.*, the 3rd vol. of his work, writes that Buonaparte refused to place the matter in the hands of the Academy. The following letter from Napoleon, dated from the Camp at Boulogne, 21st July, 1804, and addressed to M. de Champagny, Minister of the Interior, proves the contrary. It is given on the authority of "Cosmos:"—

"I have just read the project of citizen Fulton, an engineer, which you sent me much too late, for it seems capable of *changing the face of the world.* At all events, I desire that you will immediately place the examination of it in the hands of a committee, composed of members of the institute, for it is to them that the scientific men of Europe will naturally look for a decision on the question. A great physical truth stands revealed before my eyes. It will be for these gentlemen to see it, and endeavour to avail themselves of it. As soon as the report is made it will be sent to you, and you will forward it to me. Let the decision be given in a week, if possible, for I am impatient to hear it."

Ibid.

STEAM SHIP ARITHMETIC.

To the Editor of the Mechanics' Magazine.

SIR,—I share in "Mechanic's" objection to the use of the term "dynamic duty," applied by Mr. Atherton to the constant C in the expression

$$\frac{V^3\ D^{\frac{2}{3}}}{\text{Ind. H.P.}}=C.$$

I have before me a paper "On the Introduction and Progressive Increase of Screw Propulsion in Her Majesty's Navy," put forth by the officers of the steam department of the Admiralty, dated "Somerset House, May, 1850."

This paper contains a list of vessels, with every possible information relative to them, and is altogether a most valuable document. In that list I find a column as under:

Numbers showing the relative *performance* of the vessels, assuming the speed to vary directly as the cube root of the power, and inversely as			
The area of the midship section.		(Displacement)$^{\frac{2}{3}}$.	
$\frac{(\text{Speed})^3 \times \text{Mid. Sec.}}{\text{Nominal Power.}}$	$\frac{(\text{Speed})^3 \times \text{Mid. Sec.}}{\text{Indicated Power.}}$	$\frac{(\text{Speed})^3 \times (\text{Disp.})^{\frac{2}{3}}}{\text{Nominal Power.}}$	$\frac{(\text{Speed})^3 \times (\text{Disp.})^{\frac{2}{3}}}{\text{Indicated Power.}}$

Mr. Atherton's labours in this department of science are all subsequent to the date of this paper. I should like to know why he has changed the nomenclature here used. The term "performance" seems well chosen, as it is not calculated to give erroneous ideas, or to be confounded with two other scientific terms of similar sound; both of which imperfections are chargeable on the term "dynamic duty." I also agree with "Mechanic" in thinking that, in the reasons given by Mr. Atherton for adopting

this nomenclature, "the terms are too abstract, and so vague that one does not know what value to attach to them."

The only use of the new term that I can see is to involve the origin of the formula in obscurity, and to give an appearance of novelty and originality to Mr. Atherton's labours, to which they are not altogether entitled. The mere substitution for indicated horse power of consumption of coal and cost of such consumption, on the supposition that for every indicated horse power so many bushels of coal are consumed, which is an obvious extension of the application of the formula, does not, I think, entitle Mr. Atherton to alter the nomenclature which he found already in use. I do not wish to undervalue his labours; and I think, on the other hand, he can hardly wish them to pass current as possessing a more original character than really belongs to them. On every account, therefore, I believe that a return to the use of the more intelligible term "performance" in lieu of "coefficient of dynamic duty" is desirable.

I am, Sir, yours, &c.,

A Constant Reader.

RAILWAY IMPROVEMENTS—SELF-ACTING BRAKES.

Sir,—At page 186 of your present volume there appeared a notice of the specification of E. Guerin's patent for a "self-acting apparatus for working railway brakes."

This patentee claims as his invention "the application of *the principle of self-action* applied to the brakes of waggons, whatever may be the system of brakes employed."

The claim is preposterous, as well as antiquated! On reference to your 35th volume, page 110, it will be seen that "the principle of self-acting brakes" originated with, and was patented by, Mr. Joseph Bunnett, in February, 1841.* At page 274 of your 37th volume, an illustrated description of Mr. Bunnett's invention was published, from which Mr. Guerin may perceive that he has been completely forestalled in all his arrangements.

Notwithstanding the highly favourable opinion given by many eminent engineers, of the principle of self-acting brakes, no practical trial has, I believe, been made to test their value. Railway engineers, as a body, have ever evinced an uncompromising hostility towards all inventions and improvements not originating with themselves; hence the innumerable host of patented but unused schemes, which collectively would seem to be a panacea for all the ills that rails are heirs to, and which assuredly contain at least the embryo of many improvements which, reduced to practice, would tend greatly to promote the comfort and safety of railway travellers. The neglected inventions of Mr. Bunnett may be referred to as an apposite illustration of the fact.

I am, Sir, yours, &c.,

Wm. Baddeley.

February 25, 1857,
13, Angell-terrace, Islington.

* Which patent expired just two years since.

IS AERIAL NAVIGATION PRACTICABLE?

To the Editor of the Mechanics' Magazine.

Sir,—In this, my third letter on the above subject, I proceed, as I have already proposed, to show an indispensable requirement with all flying machines and navigable balloons.

Any machine which is propelled through the air for purposes of locomotion, must be capable of travelling by night as well as by day, or its journeys will be very limited. But supposing such a machine to be flying through the air in the midst of intense darkness, how is that machine to be prevented from striking the earth, either by an alteration in its own level, or by the intervention of a chain of hills or mountains? The barometer will be a guide to some extent, but not with sufficient accuracy; nor would it indicate the vicinity of elevated objects, which may stand sufficiently high to threaten the same danger to a balloon as rocks would exhibit to a ship at sea. This problem is one of far greater moment than many seem to be aware. But there is a remedy for the deficiency which has hitherto existed. I have invented a contrivance which will enable the aeronaut to observe his distance from the earth or the sea in the darkest night, and readily to estimate that distance to the nicety of a few feet. And more than this, he may be warned in due time of "breakers ahead," and may thus be on his guard to increase his elevation, so as to clear a cliff, a building, a hill, or a mountain. As I have before stated, the invention is simple, and of almost unquestionable efficacy.

The whole problem of aërial navigation may be divided into three parts, namely: floating, propelling, and steering. In the present state of the art, we seem compelled to use gas in order to overcome, at least a portion of the dead weight. But in so doing, we encumber ourselves with a very bulky apparatus. Taking the specific gravity of gas at 600, air being 1,000, a cubic foot of gas will lift half an ounce avoirdupois. Thus we require 71,680 cubic feet of gas to lift a ton, which is a bulk equal to a sphere about

51½ feet in diameter. If by the use of a balloon we are able to counterbalance a portion of the dead weight, so that the engine may cope with the remaining portion, then the entire fabric may be lifted and propelled.

In considering the propelling part of our problem, we have to observe, that the velocity is limited by the atmospheric resistance. If with a diameter of 51½ feet we construct our balloon in the form of a cylinder with hemispherical ends, we may so elongate its figure as to hold enough gas to lift four tons. If the excess of weight is a quarter of a ton, and the engine has a power equal to two tons and a quarter, there will be a residue for propelling purposes equal to two tons. The transverse sectional area of the balloon would be equal to 2,106 square feet. We may consider the atmospheric resistance to the balloon to be equal to that which would result in the case of a plane surface having the above area. Thus a velocity rather exceeding twenty miles an hour, would correspond to the above conditions, if we base our calculations of atmospheric resistance on the data given by Smeaton.

Scientific readers need hardly be told that sails are useless for a balloon; but all may not be distinctly aware that steering is impracticable unless propulsion is obtained; and that if propulsion is really obtained, steering immediately becomes practicable. If this be disputed, I am prepared to offer a demonstration.

Sir George Cayley has shown in this Magazine, many years ago, that there is a decided mathematical advantage in employing large balloons for the purposes of aërial navigation. The principle is simply this:—The buoyant power is as the volume, but the atmospheric resistance is as the sectional area. Taking the case of a sphere, if the balloon be increased in magnitude eight times, its diameter will merely have to be doubled, so that its sectional area will be simply increased fourfold, while the engine and apparatus may be increased in weight eight times. Thus the engine power may be increased in a ratio much more rapid than the atmospheric resistance.

To the same competent authority we owe the demonstration that there is nothing mathematically unsound in proposing to propel a balloon by an engine suspended in a car beneath the balloon, the deflection of the connecting ropes being limited by the proportion between the weight and the propelling power. If the weight be ten tons, and the propelling power be two tons, the deflection will be to the length of rope as two to ten; that is, as one to five, or about twelve degrees; and this amount of deflection does not increase unless the primary proportions are altered. According to the laws of mechanics, the leverage of the ropes is not rendered unequal by their obliquity. Such being the case, the equilibrium of the balloon is not disturbed by the deflection of the ropes.

The effect of the wind is not to disturb the action of the machinery; for it is not perceptible to the aëronauts or their flying locomotive. The effect of the wind is simply a matter of calculation, to be settled by a reference to the laws which regulate the composition and resolution of motion. The balloon has a velocity and a direction *in* the air. These may be called "intrinsic;" and they are not varied by the force or direction of the wind. In the next place the wind has a velocity and a direction *over* the earth. The third consideration is, What is the velocity and direction of the balloon over the earth? This may be styled the "geographical" progress of the balloon. To ascertain this progress we must combine the intrinsic progress of the balloon with the actual progress of the wind, and the result will show the geographical progress of the balloon. It is not philosophical to allow to the wind an indefinite and unlimited power. And in these inquiries "motion" may be correctly and conveniently substituted for "force."

I am, Sir, yours, &c.,

J. PITTER.

254, High-street, Southwark,
January 3, 1857.

THE WESTMINSTER CLOCK AND BELL.

To the Editor of the Mechanics' Magazine.

SIR,—After a preliminary opening in his usual style, Mr. Denison, in his letter in No. 1748 (for Feb. 7), begins by misrepresenting the portion of my last letter where I say, in commenting on the different *plans*, that his own *plan* has the same fault of striking from the second wheel in the quarters that Mr. Vulliamy's had in the hours, and that the quarters will have considerably the most work to do. Instead of the word *plan*, which I used, Mr. Denison has substituted the word *clock*, and this entirely perverts my meaning; and having thus manufactured what he terms a "falsehood" himself, he places it to my account. The plan I referred to is that on which the contract for the clock is based, and it was only to be altered in matters of detail, and in portions not shown in the going part, "especially with regard to the escapement." And I may here remark, that he surely does not expect the same construction which he has pronounced a fundamental error in the principle of Mr. Vulliamy's plan, shall be considered only as a matter of detail in his own. This plan is shown in two lithographic drawings at the end of parliamentary return No. 500, session 1852, signed with Mr. Denison's name; and the quarters are there represented as striking from the second wheel, as I said they did.

He next contradicts my statement, that the quarters will have considerably more work to do than the hours, and says they will have less; but a few figures will set this point beyond dispute. According to the contract, the clock is to strike

the four quarters on four bells of the aggregate weight of the hour bell. To do this, the quarter hammers will have to strike 960 blows in 24 hours, which, as the bells are only a quarter the weight of the hour, may be divided by 4, and this will give 240 as the aggregate force required for the quarters; whereas the hour hammer will only have to strike 150 blows of equal force in the same time. This difference will, in reality, be still greater, because small bells require a greater proportion of force than large ones of equal quality; and there is also more force lost in the drop and friction of four sets of hammer levers than of one: indeed, it is frequently found in practice that four quarters on only two bells will require more force than the hour. In the above it is, of course, assumed that the quarter bells will be equally good with the hour, or, to speak more properly, in this case, equally bad, and that they will collectively require as great a force.

With reference to the points he has numbered 2, 3, 4, 5, and 6, I have to observe that the chief facts which I wished to convey in the third paragraph of my last letter were—that Mr. Denison had occupied the position of chairman of the jury that had to decide on the merit of his design in the Exhibition of 1851, although in direct opposition to the rules laid down by the commissioners for the formation of the juries; that he has acted throughout in the capacity of referee to decide on the merits of his design of the Westminster clock; and that he is acting as referee to decide on the merits of his bell; all of which facts are proved even by Mr. Denison's letter, although he there makes them occupy quite a secondary position, instead of the first, and draws attention away from them by substituting in their place the comparatively unimportant question as to whether the various appointments were made at his own instigation as I put it, or whether he only yielded an unwilling consent at the urgent solicitation of others. Mr. Denison says the latter has been the case; but, to accept this statement, we must come to the conclusion that the commissioners of the Exhibition, and also successive commissioners of Her Majesty's works, after making rules and taking measures for obtaining an impartial judgment, directly pursue the surest course for rendering those rules and measures of non-effect, by urgently soliciting a person to become the judge of his own works.

So conclusive is this against Mr. Denison's statement, that I might rest satisfied without adducing further proof, even as regards the secondary question of whether the appointments were made at his own instigation or not; and therefore my principal reason for adding the following condensed account from the parliamentary returns, is to give more publicity to the whole matter, with a view to diminish the probability of similar appointments in future.

Mr. Denison mentions that, in one instance, he was appointed by desire of the Astronomer Royal, and I will therefore commence with this instance, and go more into detail than he has done, because there are some things in connection with it that Mr. Denison does *not* mention. On referring to the parliamentary papers at page 14, No. 436, session 1855, it will be found that the Astronomer Royal notices having proposed Mr. Denison as an additional referee to be associated with himself for the clock, under the impression that the arrangement would be found advantageous. There is, however, nothing in this instance to show that Mr. Denison had not first proposed the arrangement to the Astronomer Royal, but rather the reverse: for Professor Airy goes on to explain that, at the time of proposing Mr. Denison, he had no personal knowledge of him, and he adds, "Our subsequent intercourse has shown that our ideas of the mode of conducting public business are very different, and has at last forced on me the conviction that we cannot, with advantage, profess to act in concert;" and he goes on to tender his resignation to the Board. This resignation, after an interview between the First Commissioner and the Astronomer Royal, was not, however, accepted, and Professor Airy has remained in the capacity of referee up to the present time, but quite independent and in no way responsible for the acts of Mr. Denison, some of which have had for their object to set aside the Astronomer Rogal altogether, and constitute himself the sole referee—a circumstance to which I alluded in my last letter.

Some time before the Astronomer Royal declined to act with Mr. Denison any longer, the Board had become aware of the mistake that had been made by his appointment, and proposed measures with a view to rectify it, as we find at page 27, number 500, session 1852, that Lord John Manners, then first Commissioner, communicated a request to Mr. Denison that Mr. Robert Stephenson shall be admitted as an additional referee for the clock, and informs him, in the same letter, that Mr. Stephenson has consented to act in that capacity. Mr. Denison replies in a letter given on the same page, in which he strenuously opposes the appointment, and sums up his opposition in these words:—"And further, Lord John Manners must be aware, that there is no power now existing in anybody to subject Mr. Dent to the control of any other persons, besides those to whom he is subjected by his contract." A change of ministry soon after occurred, and Lord John Manners went out of office, and Mr. Denison carried his point, as Mr. Stephenson never appears to have acted.

After this matters went on until the Astronomer Royal declined to act with Mr. Denison, as already mentioned, and now the Commissioners appear to have made another effort to get rid of the latter gentleman, or at least to diminish the power which he retained under the old contract, as they propose, at page 15, number 436, that a new contract, for the completion of the clock, shall be entered into with Mr. Dent's successor, Mr. Dent himself having died, for containing a clause by which the approval of the clock shall be vested in the Chief Commissioner, acting under the advice of the Astronomer Royal and Mr. Denison, or *either* of them. This proposition, however, met with as much opposition from Mr. Denison as the former, and the Commissioners, now fairly set at defiance, submitted the whole case, of whether they were bound to accept the clock from Mr. Dent's successor at all, to the law-officers of the Crown, and received an opinion, signed, A. E. Cockburn, Richard Bethell, and W. H. Willes, stating they were not bound to accept it. But if the Commissioners had acted on their legal right, and refused the clock altogether, they would have visited Mr. Denison's sins on the head of Mr. Dent's successor; and so they appear to have thought themselves, for, after communicating the above legal opinion to him, they allowed the old contract to remain in force unaltered, and this placed everything on the same footing as before Mr. Dent's death; but, before this was done, the law-officers of the Crown were consulted a second time, and they strongly recommended "that, as Professor Airy could not act with Mr. Denison, the Board should insist on the substitution of some other referee or referees." The Board, however, by this time appear to have been glad to escape from the task of compelling a person to resign an appointment which his own sense of honour ought to have forced him to resign long before; so if any further steps were taken they proved fruitless, for Mr. Denison yet retains his original position of referee.

The foregoing instances show the tenacity with which he has clung to the position of referee for the clock; the following will relate to the bells:—Referring to page 23 of the return last quoted, it will be found that Mr. Denison is there requested

by the Board to draw up a specification for the bells, which request he complies with, but inserts his own name and that of the Rev. W. Taylor as the referees. The Board reply by approving the specification generally, but with the name of the Chief Commissioner to be added as an additional referee. The mere mention of another referee, however, appears to have thrown Mr. Denison into a paroxysm; for it drew from him one of the most extraordinary letters in the whole correspondence. To this letter the Board replied by summarily relieving him from the duties of referee and everything else in connection with the bells. The published parliamentary returns close with the appointment of Sir Charles Barry and Professor Wheatstone in the place of Mr. Denison; but more recent information shows that, after the death of Sir W. Molesworth, which occurred soon after, Mr. Denison was enabled to reverse the order of things, and to gain the position of referee for the bells, associated with the Rev. W. Taylor, which position he still retains. It appears, however, that the contract under which he is now acting contains an additional clause, which makes him personally responsible for any failure that may occur from using his design; and hence his determination to thrust the large bell which has been cast from it on the Government, notwithstanding his experiments have shown it to require a hammer of 12 cwt., falling 12 inches, to bring out the tone; and that it is, consequently, 10 times worse than an ordinary bell, and at least 21 times worse than the Oxford bell in this particular.

Throughout Mr. Denison's letters, whether to the Commissioners of Her Majesty's Works or any one else, the tone is frequently little better than that he is now exhibiting; in fact, no one who has come in contact with him seems to have escaped without a disagreeable taste of his peculiar mode of combat; and, amongst others, Sir Charles Barry has had the misfortune to come in for more than an ordinary share. Indeed, at page 25, No. 436, session 1855, he has carried matters against this gentleman so far as to state that the great bell would have to be taken up outside the tower, on account of the internal walls; which report was afterwards extensively circulated by an anonymous writer in the *Times:* and in several other parts of the Returns he has charged Sir Charles with having purposely built up some portions of the works and retarded others, in order to throw obstacles in the way of the clock being properly proceeded with.

As regards the Exhibition of 1851, the evidence is even stronger in its condemnation of Mr. Denison than the foregoing; but my letter is already so long, that I must dismiss the subject with the notice that it is to be found in the *Morning Chronicle* of October 8th and 24th, 1851.

Mr. Denison mentions the reluctance with which English clockmakers adopt improvements, and this is a charge from which I cannot defend them as a body; but the reluctance is not likely to be diminished by persons following the course which Mr. Denison has pursued in occupying the position of judge and referee whenever an opinion was to be pronounced on the merit of his designs, instead of following the course which others have taken—of submitting them to well-authenticated Government trials, and scrupulously leaving this part of the business in other hands.

With reference to any other portions of my letters which Mr. Denison has styled "false" or "specially false," &c., I need only add, there is no statement in them, from the first to the last, in which inaccuracy occurs even through inadvertence. Assuredly I should not willingly misrepresent facts.

I am, Sir, yours, &c.,
E. T. Loseby.

London, 28th Feb., 1857.

GUN COTTON CARTRIDGES.

To the Editor of the Mechanics' Magazine.

Sir,—Having read in the *Times* of yesterday an account of a gallant repulse of robbers, by the Rev. J. Hodder, I charged a horse pistol (eleven bore) with a gun cotton cartridge, weight twelve grains, and an ounce and a half of No. 2 shot; a wad of cork, about half an inch thick, formed the head of the cartridge, and a similar wad was rammed over the shot. Mr. Baker, proprietor of the Rosherville Hotel, fired the pistol at a deal board, at the distance of ten paces. The grains of shot buried themselves in the board: there was no uncomfortable recoil from the pistol. By using gun cotton cartridges there is this great advantage, that however long a time the firearm may remain charged, there is a *certainty* of fire; but with gunpowder it is quite different, as a miss-fire frequently occurs from the nipple becoming clogged, and other causes.

I am, Sir, yours, &c.,
J. Norton.

Rosherville, Feb. 24, 1857.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Haddan, J. C. *Improvements in the manufacture of projectiles, and in firing or discharging them from cannon.* Dated July 1, 1856. (No. 1539.)

1. Projectiles tapered at their rear ends have at those ends steps or rings, to prevent the wad jamming too tightly and bursting the gun. 2. In reference to an invention, a specification of which was filed 30th Oct., 1854, the wings or bearing surfaces there mentioned are formed upon the projectiles, by mounting them in a lathe, and causing the tools employed alternately to advance towards and recede gradually from the work, so as to form the wings. 3. For discharging projectiles from several cannon simultaneously an electro-magnetic arrangement is used.

Longridge, J. A. *Improvements in the application of mechanical power to ploughing and other field operations of agriculture.* Dated July 1, 1856. (No. 1540.)

A screw, somewhat similar to the screw propeller, is applied to the propulsion of a locomotive carriage, the motive power being placed on the carriage, which moves on broad wheels, while some portion of the weight rests on the screw propeller, which is partially immersed in the land.

Davies, J. L., jun, and J. Broadbent. *Certain improvements in umbrellas and parasols.* Dated July 1, 1856. (No. 1542.)

Channels are formed in the stick for the reception of the stretchers and ribs, which

are so secured at top and at the runner, that they may fall into their respective grooves when the umbrella or parasol is closed.

Harvey, G. and A, jun. *Improvements in machinery or apparatus for boring and drilling.* Dated July 1, 1856. (No. 1543.)

A horizontally acting drilling spindle is fitted up, with driving pulleys and gearing, upon a slide adjustable as to height, upon a vertical cast-iron pillar. If a railway wheel is to be drilled round the rim, for fixing the tyre, the wheel is set upon a number of anti-friction rollers, arranged at the base in front of the drilling spindle, and which allow the wheel to be turned round to bring the different points of the tyre opposite to the drill. The drill is adjusted as to height so as to be pointed directly to the centre of the wheel, and a clamping arm connected to the pillar is made to enter inside the rim of the wheel to hold it firmly up to the drill.

Bousfield, G. T. *Improvements in propelling and steering vessels, when the force of water is used.* (A communication.) Dated July 1, 1856. (No. 1545.)

A vessel has water-ways from stem to stern below the water. Near the head or stern, there are right angle branch water-ways. Steam engines and pumps put the water in motion in the longitudinal water-ways, and according as the valves are open at the stern or head, so will the vessel make head or stern way. By opening the valves to the branch water-ways on either side, the vessel may be propelled sideways, and may be steered by causing the water to be forced out at the side water-ways.

Dering, G. E. *Improvements in galvanic batteries.* Dated July 1, 1856. (No. 1546.)

1. Certain new exciting liquids are used for the negative element of batteries in which nitric acid, or a mixture of nitric and sulphuric acid, has usually been employed. The patentee employs the liquids resulting from the addition of the salts, nitrate of potash, or nitrate of soda, or other suitable nitrate or nitrites to sulphuric acid; firstly, in placing the salts directly in contact with the acid without previously dissolving them, and without the addition of water—unless in quantity not exceeding one-third of the whole; or, secondly, in mixing with the acid a solution of the salt in quantity not exceeding one-third of the whole. 2. He uses a mixture of nitric and hydrochloric acid (either with or without sulphuric acid, or other acids), as an exciting liquid for the negative element of such batteries. 3. He adopts certain methods of employing iron, or alloys of iron, or unamalgamated zinc, as a positive element in batteries which have their negative element excited by nitric acid or nitrous acid, or liquids containing nitric acid or nitrous acid in any form. 4. He forms the metals of batteries thicker towards the upper part, and especially at about the surface of the liquid, to compensate for the more rapid consumption at those parts. 5. He applies a covering of gutta percha or suitable materials to the metals of batteries at about the surface of the liquid, to prevent the destructive action which usually takes place there.

Hengel, J. H. V. *Improvements in apparatus for raising and lowering bodies in mines.* Dated July 2, 1856. (No. 1550.)

Two upright grooved rack supports and guides are placed in the shafts, and to the cage or bucket is applied an arrangement of catches acted on by springs, by which, if the chain or rope to which the cage is suspended break, the cage is held to the rack support.

Fleming, J., jun. *Improvements in bleaching, washing, cleansing, and preparing textile fabrics and materials.* Dated July 2, 1856. (No. 1552.)

This invention mainly consists of improvements upon a patent of the invention dated 20th Dec., 1855, but may also be used independently. It is proposed to convert winches or reels into drums, and to cause steam, hot air, water, bleaching liquids, &c., to be applied to goods passing around such drums from the interior.

Spittle, W. F. *An improvement or improvements in braiding or plaiting machinery.* Dated July 2, 1856. (No. 1553.)

Those parts of the spindles, &c., of braiding or plaiting machinery through or upon which the thread to be braided or plaited passes, are to be made of glass, china, or other vitreous or semi-vitreous substance, to reduce the wear thereof.

Green, E. *Improvements in the manufacture of buttons.* Dated July 2, 1856. (No. 1554.)

This consists—1. In the construction of flexible shank buttons, the foundation of which is of metal, and covered with a woven fabric. The flexible shank is held firmly between two flanges, one of which forms the front, and the other the back shell of the button. 2. In constructing buttons with a certain metallic bar or shank formed of the front or back shell. Modifications of this are described. 3. In forming metal buttons, the front and back shells of the buttons are pierced with holes and embossed.

Marais, T. E. *Improvements in railway signals.* Dated July 2, 1856. (No. 1557.)

Apparatus is so arranged that a detonating signal is, by the passage of a train, brought into position to be exploded by a following train, and so that it is held in this position during any period of time, and is then withdrawn by the apparatus.

WILLIAMSON, J., and J. C. STEVENSON. *Improvements in evaporating saline solutions.* Dated July 2, 1856. (No. 1558.)

To prevent incrustation of salts on the heating surface of the evaporating vessel when heated by fire applied to the sides, and not at the bottom, the patentee places a vertical axis with arms, which nearly reach the side of the pan, and by the revolution of these arms a continuous circular motion of the contents of the pan is kept up.

HUBBARD, W. H. *Improvements in the manufacture of articles for lighting domestic and other fires.* Dated July 2, 1856. (No. 1559.)

This consists in so combining the pieces of wood of which fire-lighters are made, that they lock or fit into each other without the aid of any fastening.

BURNETT, W. H. *Improvements in electric telegraphs and in apparatuses employed therein.* Dated July 2, 1856. (No. 1560.)

These have reference to contrivances by which the patentee works different needles or indicators, as well as chemical or other recording machinery, electively, with only one wire; to arrangements at the transmitting end, by which he sends quickly and certainly the various currents required for working such apparatuses, needles, &c.; to arrangements of the needles or indicators themselves, as well as the coils and magnets used to set them in motion; and to certain mechanical registering or recording machinery at the transmitting end.

NEWTON. A. V. *Improvements in air engines.* (A communication.) Dated July 2, 1856. (No. 1561.)

This invention cannot be described without illustrations.

NEWTON, A. V. *Certain improvements in machinery for manufacturing rope or cordage.* (A communication.) Dated July 2, 1856. (No. 1562.)

1. The strand flyers of the laying machine, when arranged to rotate upon their own axes, and round a common axis, are driven on an improved method. 2. The strand cams are secured in flyers, so that facility is afforded for replacing the empty cams by full ones. 3. Improved means of stretching the rope as fast as it is laid are adopted.

PENDLEBURY, J. *Improvements in machinery or apparatus for bleaching or cleansing textile fabrics or materials.* Dated July 3, 1856. (No. 1563.)

Apparatus is arranged for bleaching or cleansing manufactured or piece goods, or yarn of cotton, linen, &c., by the use of high pressure steam for heating and forcing the bleaching liquor, &c., from the liquor pan into a close vessel or goods kier, through a communicating pipe, from the top of one vessel to the other; another pipe extends from the bottom of one vessel to the other, so that constant circulation of the bleaching liquor through the goods is kept up.

BROWN, J. *Certain improvements in hats and caps.* Dated July 3, 1856. (No. 1567.)

This consists in ventilating hats and caps, by making a hat or cap-body, or part thereof, without a crown, and over this another body, or part of a body, without a brim, but with a crown to fit loosely over the first body, which might be so arranged as to be pushed up to admit air, or closed to exclude it. Modifications are described.

GREAVES, H. *Improvements in looms for weaving.* Dated July 4, 1856. (No. 1568.)

This relates to a loom for weaving two or more distinct pieces of cloth at the same time, and giving to each piece perfect selvedges, which are accomplished by employing as many reeds, breast beams, courses on the stay or lathe, shuttles, and pairs of shuttle boxes, as there are pieces of cloth to be woven.

BRADFORD, E. G. *An improved rudder.* Dated July 4, 1856. (No. 1569.)

This rudder is hung equally on each side of a vertical, or nearly vertical axis, so that, when turned at right angles to the keel, it offers an equal resistance on each side thereof, and merely retards the vessel's progress.

CHANDLER, T. *A lever cask stand.* Dated July 4, 1856. (No. 1570.)

A lever stand or tilt is mounted and nearly balanced on a fulcrum, so that the tilting is easily effected. The cask is also readily put in position, in which it is held by a ratchet arm taking into a fixed stop on the stand.

HOWARD, R. L. *Improvements in valves for regulating the flow of fluids.* Dated July 4, 1856. (No. 1572.)

For regulating the flow of water down water-closets, &c., a disc valve (which constitutes the supply valve) faced with leather, is employed, in conjunction with a valve piston of a peculiar construction working water-tight in a short cylinder.

JOHNSON, J. H. *Improvements in machinery or apparatus for cleaning and carding cotton and other fibrous substances.* (A communication.) Dated July 4, 1856. (No. 1573.)

1. A curved grate is applied below the main carding drum for facilitating the separation of dust, dirt, &c., from the material under treatment. 2. A peculiar arrangement of jacquard mechanism is used for removing the top cards, and holding them in a suitable position for being stripped or cleaned.

CORNIDES, L. *Improvements in cementing and uniting together plain or ornamented surfaces of glass, or in uniting surfaces of glass*

to surfaces of metal or other material. Dated July 4, 1856. (No. 1574.)

The following transparent cementing compositions or solutions are used, and the cemented articles joined in an air-tight apparatus to which heat is applied. Cement No. 1 is composed of 4 parts of gum damar, with 1 part of spirits of turpentine. No. 2, 1 part gelatine, 1 sugar, and 8 water. No. 3, 4 parts gelatine, 1 sugar, 4 water, and 1-16th creosote.

TRAVIS, E., and J. L. CASARTELLI. *Certain improvements in steam engines.* Dated July 5, 1856. (No. 1575.)

In condensing-engines, a novel construction of air-pump becomes the condenser also, the action of the air pump being reversed. The water is depressed by the descent of the bucket, and is discharged through a suitable valve in the lower part of the pump barrel, forcing all the uncondensed steam and air along with it out of the air-pump.

ADSHEAD, J. *A new application of a known material to be used as a substitute for plastering, painting, papering, whitewashing, and colouring.* Dated July 5, 1856. (No. 1577.)

This consists in the use of the painted or distempered and varnished fabrics, known as oil baize or oil cloth for the above purpose.

LEWTAS, J., and J. HUMPHREYS, jun. *Improvements in apparatus for holding and releasing cords, chains, bands, or bars.* Dated July 5, 1856. (No. 1578.)

These are improvements upon an apparatus patented by J. Lewtas, 17th Sept., 1855. The cords, chains, &c., to be held or released pass between a moveable roller, ball, or block, and a fixed plane or surface; and the slots before used for guiding the roller are dispensed with.

MANNING, J. A. *Improvements in the manufacture or production of manure.* Dated July 5, 1856. (No. 1579.)

This relates to the production, by various elaborate processes, of an artificial manure from the waste matters of towns, combined with other ingredients.

SMITH, T. *Improvements in horse rakes.* Dated July 5, 1856. (No. 1582.)

With each of the wires or teeth is combined a counterbalance weight tending to raise the wires or teeth from the land.

BLACKSTONE, L. *Improvements in the manufacture of corks and bungs.* (A communication.) Dated July 5, 1856. (No. 1583.)

In cutting corks and bungs of cylindrical and conical forms a rotating tubular-shaped cutter is employed, mounted on a hollow axle through which a plunger passes for pushing out the cork when cut. The hollow axle carries a pulley, driven by a strap. The blank of cork is pressed up to the cutter by a disc carried by a sliding shaft connected with the plunger. The act of withdrawing the disc to prepare for a second cut causes the advance of the plunger.

MILLWARD, R. *An improved instrument which may be used as a screw key or gauge.* Dated July 7, 1856. (No. 1585.)

A polygonal stop-piece is applied to regulate the opening between the fixed and the sliding jaws forming part of the instrument.

SHAW, R. *Improvements in obtaining pressure applicable to machinery for preparing and spinning cotton and other fibrous materials, and other purposes.* Dated July 7, 1856. (No. 1586.)

Pressure is obtained by the application of an endless revolving band, passing around the rollers on or between which the pressure is to be exerted; also in a combination of parts for saving friction, particularly applicable to "throstles," by means whereof a portion of the motive power expended in obtaining the friction or drag is returned again.

SAMPSON, G. *Improvements in finishing fabrics.* Dated July 7, 1856. (No. 1591.)

Alpacas, mixtures, barége, orleans, coburgs, &c., are conducted in contact with a series of heated surfaces, partly moving and partly stationary, in combination with a modification of a plaiting machine, to give lustre or finish thereto, in substitution of that ordinarily given by press papers and heated press plates.

CAMBRIDGE, W. C. *An improvement in the construction of press wheel rollers and clod crushers.* Dated July 7, 1856. (No. 1592.)

The patentee makes the wheels or discs of unequal diameters, and arranges them loosely on a common axle, placing alternately one of smaller, and then one of larger diameter. In the larger wheels he forms the central hole (to receive the axle) of a three-sided figure, and of such size as will permit of these wheels preserving, when in action, the same mean ground level as the smaller, and thus the adjacent discs are caused to slip past each other, and so clear themselves of the adhering soil.

SMITH, H. *An improvement or improvements in the manufacture of harrows.* Dated July 7, 1856. (No. 1593.)

This consists in attaching the tines or tangs of harrows to plugs fixed to the framing, the said plugs entering cavities made in the shoulders of the tines or tangs for their reception, and the parts of the framing being held together independently of the tines or tangs.

HORSFALL, J. *An improvement or im-*

provements in the manufacture of wire rope. Dated July 7, 1856. (No. 1594.)

Wire rope is made wholly or partially of hardened and tempered steel wire.

LAING, W. *Improvements in stretching or breadthening woven fabrics.* Dated July 7, 1856. (No. 1595.)

The essential feature here is the use in breadthening apparatus of an elastic web to be passed through along with the fabric to be stretched.

HEALEY, E. C., and E. E. ALLEN. *An improvement in preparing for use veneers, paper, and other fabrics or sheets made of fibres.* Dated July 7, 1856. (No. 1597.)

This invention consists in corrugating such veneers or sheets. The mode of operating varies with the nature of the wood from which the veneers are cut, and with the materials of which the sheets are made.

CONDY, H. B. *Improvements in defecating or purifying acetic acid and other solutions, also in disinfecting rooms and other places, and in preserving wood.* Dated July 7, 1856. (No. 1598.)

The manganate or per-manganate of soda or potash is used for the above purposes. And acetic acid is further purified by roasting the acetate of lime from which it is made in a revolving retort or vessel, or a retort with a mechanical agitator.

WATKINS, G. B. *Improved apparatus for obtaining infusions or extracts from various substances.* Dated July 8, 1856. (No. 1600.)

Fitting loosely in the outer casing of this apparatus is a sieve or percolator, having in the centre of it a perforated cylinder extending from bottom to top, and having in it a moveable piston worked by a rack. The substance, say coffee, is placed in the percolator, and the water is poured upon it, finding its way through the cylinder into the bottom of the outer casing, whence it is drawn off by a tap.

YOUTMAN, W. *Improvements in valves and plugs.* Dated July 8, 1856. (No. 1601.)

A shield or guard, with a tongue or valve of vulcanized India-rubber, is applied to pipes, closet holes, &c., and as a plug for boats. The tongue or valve admits the passage of liquids outwards, but prevents their admission.

WELLS, J. H. G. *Improvements in pistons for steam and other motive power engines and pumps in general, and which improvements are also applicable to stuffing boxes.* (A communication.) Dated July 8, 1856. (No. 1602.)

The piston is of cast-iron, and of one piece, and surrounded by a ring of elastic material. The pressure of the steam, gas, or liquid acts upon the said ring, and presses it against the cylinder. The piston or other rod is similarly packed.

WELLS, J. H. G. *Improvements in governors or regulators.* (A communication.) Dated July 8, 1856. (No. 1603.)

The improved governors, &c., cannot be described without illustrations.

HOFFMAN, F. W. *An improvement or improvements in breach-loading fire arms.* Dated July 8, 1856. (No. 1604.)

A moveable cap is applied to the end of the barrel, in lieu of the usual breech pin, and the removal and replacing of the said cap are effected by the act of cocking the piece.

PAGE, H. *Improvements in ornamenting or decorating glass.* Dated July 8, 1856. (No. 1605.)

The ornamental designs are cut on blocks (as in calico printing, &c.), or out of thin metal (as in stencilling): If on blocks, the blocks receive colour from a sieve or roller as in paper staining; if out of plates, the colour is put on with a brush, and applied at once to the prepared glass. The following method is preferred: the patentee prepares calico with a coat of size, dries it, and prints the design on it with colours made up in varnish, oil, or spirit. The glass is now roughed (as with emery), coated with white body varnish, and before it dries, the design is turned down upon it, and pressed. The back is then moistened, and the calico drawn off, leaving behind the coloured design, which is then hardened by gradual heating,

BELLEVILLE, J. F. *Certain improvements in generating and applying steam.* Dated July 8, 1856. (No. 1606.)

This relates to a patent of M. Belleville's, dated 12th Nov., 1852, and consists in a new arrangement of the tubes in which steam is generated, and in the employment, in combination therewith, of the furnace patented by him 9th Oct., 1855; and also in a contrivance for regulating the temperature. The tubes are arranged horizontally.

MARTINEAU, R., and B. SMITH. *Improvements in taps for drawing off liquids.* Dated July 8, 1856. (No. 1607.)

1. Such taps or cocks as are provided with a passage through the tail thereof for the admission of air into the cask or vessel, are lined with cork to promote the flow of the liquid. 2. A passage is made for the admission of air into the spout of such taps or cocks to complete the discharge of the liquid.

NEWTON, A. V. *Improvements in repeating fire arms.* (A communication.) Dated July 8, 1856. (No. 1608.)

This relates to fire-arms in which the rotating charge cylinder works on an axle parallel with the barrel. 1. A toggle is employed for effecting a longitudinal move-

ment of the cylinder to make it clear the barrel in rotating, and to force it afterwards up into a tight connection therewith, the toggle being operated by a finger lever under the stock. 2. A regulating screw is placed between the toggle and the recoil shield, for adjusting the connection between the cylinder and barrel. Other details are included.

NEWTON, A. V. *An improved fountain pen.* (A communication.) Dated July 8, 1856. (No. 1609.)

In fountain pens, a slit taper tube, which tapers to a point, forms the nibs of the pen, and is connected with an ink reservoir. The ink remains in the reservoir and tube when the instrument is not in use, but flows from the point when it is moved on a sheet of paper. The pen works like a lead pencil.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

HOPE, D. G., and W. A. FAIRBAIRN. *Certain improvements in steam engines.* Dated July 1, 1856. (No. 1541.)

Claims—1. A novel form of steam valve for obtaining direct transmission of steam into the cylinder is combined with an easy exhaust, thus avoiding great waste of steam in the ports. 2. The slide valve is formed of a wedge shape for allowing the valve to wear upon both faces, and still continuing steam tight without packing. 3. An arrangement is adapted in which the cylinder is cast with steam ports directly through the side at each end, at right angles to the valve facing, the ordinary eduction port being dispensed with, and the exhaust steam carried through the valve and steam chest.

NEWTON, A. V. *An improved construction of door lock.* (A communication.) Dated July 1, 1856. (No. 1544.)

Claims—1. The arbor of the lock is so arranged in relation to the bolt, that the bolt may be operated by drawing and pushing the arbor in and out, or by moving and sliding the arbor without turning it in a direction transversely with the bolt. 2. A bolt which turns upon a centre is used, and is connected with the arbor by a rock lever, so as to be operated by the thrust of the arbor. 3. A series of sector tumblers, are fitted between sliding plates, and arranged with a spring, whereby the moving of a single tumbler is prevented and the lock rendered unpickable.

HAY, J. and J. *Improvements in the production of pearl barley.* Dated July 1, 1856. (No. 1547.)

Barley is reduced between a pair of millstones, after it has been first reduced partly by a barley mill, and then finished in a barley mill.

LOAM, M. H. *Improvements in meters for measuring water and other fluids.* Dated July 1, 1856. (No. 1548.)

The inventor describes a meter in which water confined between two flexible diaphragms is alternately driven from one side to the other of a fixed partition, and thus is the means of measuring the fluid which flows into and out of the compartments of the meter.

JOHNSON, J. H. *Improvements in the manufacture of cast steel.* (A communication.) Dated July 2, 1856. (No. 1549.)

The metal having been decarbonised in the puddling furnace, is either conveyed direct to the fusing crucibles, or plunged into cold water, or reduced to powder or grains by stampers, and then put into the crucibles. A mode of arranging the puddling and smelting furnaces and the fusing crucibles is also described.

HEYNS, P. *Improvements in axles, boxes, and wheels for carriages.* Dated July 2, 1856. (No. 1551.)

The inventor forms axles with each end tapering inwards as far as the part where the wheels are fixed. The tapering parts are enclosed each by a cap fitting the axle. These caps are of two or more parts, fastened together. The inner end of the cap is enlarged, and partly hollowed for containing a lubricating substance, and has a groove cut in it, to convey the substance around the axle. He forms a wheel by joining two discs of boards so that the grain of the one disc shall be at right angles to that of the other, and the tyre of angle or T iron.

HUMBER, W. *Improvements in the permanent way of railways.* Dated July 2, 1856. (No. 1555.)

Chairs are made with the passage to receive the rail and the apparatus for fixing it, tapered in two directions—from the middle of the chair towards its sides. Metallic wedges or keys are used, a pair to each chair, forced in opposite directions by wedges, keys, or bolts. Also, the ends of two rails, resting in two of the improved chairs are fished by a fishing plate on one side of the rails, having a wedge at either end as above, and fitting into each chair respectively, and the plate being secured to one or both rails. Also rails are secured in the chairs by wooden wedges or keys having bolts or straps through them in the direction of the rails, whereby they may be held in position.

NOURISSON, A. *Improvements in drying and burning bricks and other articles of clay.* Dated July 2, 1856. (No. 1556.)

The inventor employs a furnace and a series of chambers heated successively by it. The bottom of the chambers is in sections, which can be transferred from chamber to chamber. The moulded bricks are loaded on to a carriage which moves through a drying

stove, and is then transferred to one of the sections of the bottom in the first of the chambers, thence it moves onwards until it arrives in a chamber exposed to the full heat of the furnace; this section of the bottom descends to a cooling chamber, through which passes a current of air which heats the drying stove.

EWING, J. *A new or improved portable receptacle for urine and other human secretions.* Dated July 3, 1856. (No. 1564.)

In order to allow children or adults to deposit secretions when they cannot retain them, a bag or napkin of india-rubber, or vulcanised india-rubber, with a series of pouches or reservoirs connected therewith, is fastened round the hips by an elastic belt, lacing in the front.

PEIRCE, J. C. H. *Improvements in glass chandeliers, lustres, and other such means used in lighting.* Dated July 3, 1856. (No. 1565.)

To produce upon the glass ornaments when a clear or uncoloured glass is employed, effects corresponding with the use of coloured and more costly glass, and of metal, the glass is coated on the side which is not to be exposed to view, with gold or silver (in leaf by preference) and then protected by a coating of varnish.

CURWOOD, D. *Improvements in horse rakes, which improved rakes may also be rendered applicable for scarifying land.* Dated July 3, 1856. (No. 1566.)

The rake teeth or tines are mounted on an angular or A-shaped frame. The traction of the horse may be at the apex of the angle, in which case the frame is furnished with a shield placed above and immediately behind the tines, against which shield the hay or other crop as it is raked up presses, and is guided so as to be thrown off on either side of the machine. Modifications are described.

FOSS, J. *Improvements in machinery for cutting and sawing.* Dated July 5, 1856. (No. 1576.)

The cutter is formed of two thin steel blades, brought in contact with one another, or nearly so, passed between two pairs of adjustable rollers, and stretched over two pulleys, the one above the top set of rollers, and the other under the bottom set. The blades move in opposite directions. The working parts are fixed in a suitable framework, and a table applied for supporting the material to be cut.

COMBETTES, P. C. J. L. DE. *An improved steam engine.* Dated July 5, 1856. (No. 1580.)

Steam acts upon a pendulum to make it vibrate, and the power is communicated to a crank, through a connecting rod affixed to the shaft of the pendulum.

LETESTU, J. M. *Certain improvements in extracting liquids and solid or pasty matters.* Dated July 5, 1856. (No. 1581.)

The inventor first compresses air in a vessel, and passes it through a pipe to another vessel (in which are the matters to be extracted) hermetically closed except to the pipe, and to a pipe which descends to near the bottom thereof. Upon opening communication, the contents of the latter vessel are driven out through the exit pipe into receivers.

PILLINER, F. J. *Improvements in clasps or fastenings for waistbands and other descriptions of bands or straps.* Dated July 7, 1856. (No. 1584.)

The improved clasp consists of two parts connected by certain loops and a socket.

COMBETTES, P. C. J. L. DE. *Certain improvements in rotary steam engines.* Dated July 7, 1856. (No. 1596.)

A rotary engine is constructed in which the centre is open, the steam being admitted into an annular chamber and acting upon one piston only, fixed upon a wheel keyed to a shaft through which power is transmitted. The steam stop is made to rise and allow passage to the piston, and to fall immediately after by steam let into a supplementary cylinder by suitable gear, &c.

PROVISIONAL PROTECTIONS.

Dated November 21, 1856.

2768. Alexander Clark, of Gate-street, Lincoln's-inn-fields, engineer. Improvements in the application and construction of revolving window-shutters and blinds and metal window-sashes.

Dated January 22, 1857.

190. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. Improvements in the preparation of oil for lighting, and in lamps, glasses, or chimneys to be employed in burning the same. A communication.

Dated January 27, 1857.

241. David Yoolow Stewart, of Glasgow, iron-founder. Improvements in moulding or manufacturing cast-iron pipes.

Dated February 12, 1857.

409. William Bridges Adams, of Adam-street, Adelphi, engineer. Improvements in buildings and other structures.

Dated February 16, 1857.

446. Jean Marie Letestu, mechanician, of Paris. Improvements in signals.

448. William Edward Newton, of Chancery-lane, civil engineer. Improved machinery for manufacturing nuts and washers. A communication.

450. Thomas Newcomb, of Cowley-place, Commercial-road, Peckham, Surrey, machinist. Improvements in machinery for manufacturing nails.

452. Joseph Quick, jun., and Alexander Fraser, both of Sumner-street, Southwark. Improvements in apparatus for regulating the drawing off and the supply of water and other fluids.

453. Alexander Parkes, of Bath-row, Birmingham. Improvements in the manufacture of nails.

454. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in machinery or apparatus for the manufacture of pasteboard. A communication.

Dated February 17, 1857.

456. Thomas Ball, of Hyde-street, St. George, Bloomsbury. An improved portable oven for baking bread and other articles of food, in the camp, the field, or the house.

458. Charles Cowper, of Southampton-buildings, Chancery-lane. Improvements in making drains, and in machinery for that purpose. A communication.

460. William Burslem and John Burslem, of Cheadle, Chester, picker-manufacturers. An improved picker to be used in power-looms for weaving.

462. Thomas Withnall, of Manchester. Improvements in the manufacture of copper, brass, or other metallic rollers or cylinders.

464. Harby Barber, of Belgrave, Leicester, manufacturer. Improvements in knitting-machinery.

466. Augustus Kaltwasser, of Grove-street, Camden-town, pianoforte-maker. An improvement in the action of horizontal pianofortes.

468. Robert Barlow Cooley, of Nottingham. An improvement in the manufacture of knitted fabrics.

470. John Naylor, of Winterton, near Brigg, Lincolnshire. Improvements in horse-hoes.

Dated February 18, 1857.

471. Charles De Bergue, of Dowgate-hill, London, engineer. Certain improvements in marine steam engines.

472. Jacob Green, of Philadelphia, U. S. Improvements in furnaces for burning combustible gases under pressure in the manufacture of glass, iron, and other metals.

473. Hector Christie, of Salford, Lancaster, cotton-doubler. Improvements in finishing and polishing threads and yarns.

474. Robert Best, of Birmingham, manufacturer. An improvement or improvements in illumination.

475. John Rylands, of Warrington, Lancaster, wire-manufacturer. Improvements in annealing wire.

476. Julien Blanc, of Rue St. Louis, Batignolles, near Paris. Improvements in making bread and biscuits. A communication from P. Hauns and L. Girard.

478. John Moule, of Seabright-place, Hackney-road, manufacturing chemist. Improved apparatus to be used for burning pyrotechnic compositions or preparations for producing artificial lights of various colours.

479. David Cheetham, of Rochdale, Lancaster, machinist. Improvements in machinery or apparatus for preparing, spinning, and reeling cotton and other fibrous materials.

480. Samuel Dyer, of Bristol, ship-owner. Certain improvements in ships' windlasses, capstans, bumpkins, gins, and cranes.

481. Louis Léon Foucher, of Petite Rue Taranne, Paris, engineer. Improvements in apparatus for the manufacture of type and other articles used in letter-press printing.

Dated February 19, 1857.

484. David Lloyd Price, of Beaufort, Brecknock, electrical engineer. Improvements in electric apparatus for giving signals, and appliances connected therewith.

485. William Halsall and William Hayhurst, both of Bury, Lancaster, machine-makers. An improved self-acting temple to be employed in power-looms for weaving.

486. James Abernethy, of Westminster, civil engineer. An improved mode of constructing breakwaters in deep water.

487. James Crook, of Winckworth-place, Hoxton. Improvements in looms for weaving elastic and other fabrics.

488. Thomas Clayton, of Manchester, machinist. Improvements in machinery or apparatus for ornamenting and embossing wood, leather, paper, and other similar materials.

489. William Clark, of Chancery-lane, engineer. Improvements in the manufacture of sheet glass. A communication.

490. James Lord, of Brierley-street, Rochdale, engineer, and William Soothill, of Stock-road, Rochdale, engineer. Improvements in steam boilers for the more effectual consumption of smoke, whereby a great saving of coal will be effected.

491. Henry Young Darracott Scott, of Brompton Barracks, near Chatham, Kent, captain in the Royal Engineers. An improved manufacture of cement.

492. Peter Cato, of Liverpool, ship-builder, and Joseph Betteley, of Liverpool, anchor-manufacturer. Improvements in the masts, yards, and spars for ships or sailing vessels.

Dated February 20, 1857.

493. William Oakes, of Stockton-on-Tees, Durham, furnace-manager. Improvements in the manufacture of iron.

495. Edward Edwards, of Abenbury Forge, Wrexham, Flint, ironmaster. Improvements in the manufacture of chains for cables and other purposes.

496. John Grist, of Islington, engineer. Improvements in mash-tuns, and in apparatus to be employed therewith, which apparatus is also applicable to the heating and keeping up of a continuous circulation of liquids in any vessel to which it may be connected.

497. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. Improvements in steam digging apparatus suitable for draining and excavating purposes, parts of which are applicable to reaping. A communication.

499. John Combe, of Leeds, engineer. Improvements in the construction and driving of power-looms, in the formation of shuttles, and in the winding and arrangement of weft, parts of which improvements are applicable to other purposes.

500. Frederick Charles Jeune, of Gresham-street, London, India-rubber manufacturer. An improved manufacture of artificial leather.

501. Joseph Glover, of Liverpool, photographer, and John Bold, jun., of Liverpool, watch and clock-maker. Improvements consisting of extended uses of photography as applied to dials, tablets, and pictures.

502. Wilhelm Zipser and Johann Peter Klein, of Biala, Austria. Improved machinery or apparatus to be used in the manufacture of woollen cloth.

Dated February 21, 1857.

504. Elkan Adler, of New York, U. S. Improvement in spring bed-bottoms, said bottoms being applicable to other descriptions of furniture.

505. Alexander Theophilus Blakely, of Tonbridge Wells, Kent, captain R.A. Improvements in ordnance.

506. John Elce, of Manchester, machinist, and Samuel Hartley, of the same place, brass-moulder. Improvements in machinery for moulding.

507. Joseph Fielding, of Ashton-under-Lyne, Lancaster, machinist. An improved apparatus applicable to steam pipes or cylinders used for heating and drying, which said apparatus may be similarly employed wherever steam is used for such purposes.

508. John Whitehead, of Preston, Lancaster, agricultural-implement maker. Improvements in boilers.

509. Francis Hay Thomson, of Glasgow, doctor of medicine. Improvements in the manufacture of iron.

510. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in spinning-

machines. A communication from J. Smith, of Northbridge, U. S. A.

511. John Barber, of Manchester, machinist. Improvements in compound printing maundrills.

512. John Middleton, of Hyde, Chester, and William Stent, of Fairfield, near Manchester. Improvements in railway chairs, and in the jointing of rails for railways.

513. John Turner, of Syresham, Northampton, baker. Improvements in the process of manufacturing bread, and in the component parts of the same.

514. Victor Touche, of Rathbone-place, Oxford-street, gentleman. Improvements in the manufacture of paper from bass or bast.

515. John Williams, of Wigginton, Oxford, clerk. Improvements in common-road vehicles.

516. Michael Grouse, of Oxford-street. An improved apparatus for giving stability to life-boats and other boats.

517. George Phillips, of Hammersmith, Middlesex. Improvements in stationery cabinets, and in envelopes to be used therewith.

518. William Gossage, of Widnes, Lancaster, chemist. Improvements in the manufacture of soda and potash.

519. Auguste Quidde and Charles Mayet, both of Biala, Austria. Certain improvements in propelling.

Dated February 23, 1857.

521. William Footman, of Rodney-street, Pentonville. Further utilizing the illuminating properties of gas, by improvements in burners and shades or reflectors.

523. Joseph James Bannister, of Southwark, furniture-dealer. An improved watch and property protector pocket.

525. Francis Conilliane La Croix, of New York, U. S. A. An improvement in reducing and reefing the topsails of vessels.

527. James Edward Shearman, of Pimlico, Middlesex, Esquire. Improvements in saddles and collars for horses and other animals.

529. William Edward Newton, of Chancery-lane, civil engineer. An improved furnace for locomotive and other boilers. A communication.

531. Jacques Henri Marie Maissiat, of Paris, chemist. Improvements in dibbling-machinery for depositing grain and manure.

533. Laurent Laurot, of Rue Fontaine, Saint George's, Paris, chemist. Separating the different solid fatty (acides gras) acids from the liquid fatty ones.

535. John Milnes, of Sutton-mill, Kildwick, York, overlooker, and William Thompson, of Sutton-mill aforesaid, mechanic. Improvements in looms for weaving.

Dated February 24, 1857.

537. Richard Archibald Brooman, of 166, Fleet-street, London, patent-agent. Improvements in under skirts or petticoats. A communication.

539. Joseph Betteley, of Liverpool, anchor-manufacturer. Improvements in machinery for lifting and working anchors, cables, and other weights on shipboard.

541. Alexander Parkes, of Birmingham, practical chemist. Improvements in separating tin from tin-plate scrap, and tin or zinc from other surfaces of iron.

543. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in fastenings for dress and other purposes. A communication from H. Marie, of Paris.

545. Alexander Mitchell, of Peterhead, Aberdeen, N. B., machinist. Improvements in harpoon guns.

Dated February 25, 1857.

547. William Wood, of Monkhill-house, near Pontefract, York, gentleman. Improvements in machinery or apparatus used in the manufacture of carpets and other pile fabrics.

549. James Fenton, of Low Moor, near Bradford, York, civil engineer. An improved method of connecting the feed pipes of locomotive, engines and tenders.

551. Laurent Piaud, of Rue de l'Echiquier, Paris. Improvements in ventilating and preventing inundations in coal-mines.

553. Louis Emile Ossian Degrand, gentleman, of Paris. Certain improved lenticular glasses for lighting and reflecting or refracting.

555. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in apparatus or instruments for measuring distances and elevations. A communication from E. A. Crandall, of Friendship, New York, U. S. A.

557. Moses Haym Picciotto, of Crosby-square, London, merchant. Improvements in preparing flax, hemp, and other fibrous substances.

559. Auguste Godet, Capne. de Marines, of Bordeaux. Improvements in reefing sails.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," March 10*th*, 1857.)

2517. H. F. Forbes. An improved copying press.

2532. J. K. Cheetham. Improvements in the manufacture of iron and steel.

2538. L. A. Faure. An improved pump.

2540. T. John. A new electric telegraph apparatus for writing.

2543. W. Kopke. An improved clasp-board to hold documents for reference.

2550. W. May. Improvements in steam-engine indicators. A communication.

2564. J. Browne. Improvements in the construction and working of ships' windlasses and capstans, part of which improvements are also applicable for steering ships and other vessels.

2566. B. Stott. Improvements in machinery or apparatus for preparing, spinning, and doubling cotton, wool, flax, or other fibrous materials.

2568. J. Parbery. Certain improvements in horse collars.

2574. W. J. Curtis. Improvements in lighting and ventilating railway carriages.

2576. S. Tearne and G. W. Richmond. Certain improvements in producing ornamental designs on the surfaces of fancy and other goods made of papier maché, wood, glass, china, earthenware, tin, iron, or other such like materials, the surfaces of which when made up are usually finished by staining, varnishing, painting, or japanning.

2577. J. Nasmyth and R. Wilson. Improvements in hydraulic pumps and presses for packing cotton and other articles of the like nature.

2580. E. N. Cadet. Improvements in the construction of cocks and taps.

2593. W. Weild. Improvements in velvet or cut pile fabrics, and in looms or machinery used for weaving such velvet and other loop pile fabrics.

2596. C. Titterton. Improvements in the manufacture of zinc and zinc white.

2598. W. E. Newton. Improvements in steam engines. A communication.

2599. W. Clissold. Improved apparatus for regulating the supply of water to water wheels.

2602. W. Brindley. Improvements in the preparation of paper hangings and other ornamental papers.

2603. R. W. Sievier. An improvement in the mode of treating saccharine juices in the manufacture of sugar.

2604. J. Stanley. Improvements in the construction of and mode of applying cranes and

other machines to hoisting, suspending, and lowering purposes, also in generating, transmitting, and applying motive power to the same.

2631. C. Vaughan, W. J. Vaughan, and R. Vaughan. A new or improved strap or band for working stamps, raising weights, and transmitting power generally.

2633. W. Morphet. Improvements in producing the velvet pile and Witney finish in cloths, and in machinery or apparatus for the same.

2643. W. Stones. An improved mode of sizing paper.

2657. J. Bernard. Improvements in the manufacture or production of boots and shoes or coverings for the feet, and in the machinery or apparatus employed in such manufacture.

2661. W. Wield. Improvements in machinery for doubling, twisting and winding yarns or threads on to bobbins or spools.

2663. H. Collett. Improvements in machinery for mowing and reaping.

2674. C. W. Dixey. Improvements in double opera glasses and other glasses of a similar nature.

2692. H. C. Ash. Improvements in railway signals.

2734. W. E. Newton. An improvement in centrifugal pumps. A communication.

2740. L. A. de Milly. Improvements in the manufacture of fatty acids.

2753. L. Dartois. An improved machine for the cleansing of textile and fibrous substances.

2766. C. Garton and J. St.J. G. Parsons. A method of treating cane sugar, in order to fit it to be employed in brewing and distilling.

2771. A. R. Terry. Improvements in sawing, splitting, cutting, and binding kindling wood.

2784. M. J. Cooke. Certain improvements in washing, wringing, and mangling machines.

2895. W. S. Clark. Improvements in combined caldron and furnace, for agricultural and other purposes. A communication.

2931. J. Green. Improvements in the mode of manufacturing glass lights for street vaults, ships, buildings, and friction boxes, and the apparatus for ladling or conveying the molten glass from one furnace or another.

99. A. Goodwin. An improvement in fixing the tubular flues of steam boilers.

186. H. Medlock. An improved method of purifying water.

228. R. A. Brooman. Improvements in the preparation of woollen hats, bonnets, and bodies for hats and bonnets. A communication.

237. J. Dangerfield. Improvements in the manufacture of chains.

241. D. Y. Stewart. Improvements in moulding or manufacturing cast iron pipes.

341. J. Gilroy. Improvements in applying starch or other semifluid matter, by machinery, to woven fabrics.

359. T. Brown and G. Parry. Improvements in the manufacture of iron.

425. P. H. Sykes. An improved apparatus for supplying or feeding boilers with water, applicable to raising and forcing liquids for other purposes.

446. J. M. Letestu. Improvements in signals.

454. J. H. Johnson. Improvements in machinery or apparatus for the manufacture of pasteboard. A communication.

456. T. Ball. An improved portable oven for baking bread and other articles of food, in the camp, the field, or the house.

468. R. B. Cooley. An improvement in the manufacture of knitted fabrics.

470. J. Naylor. Improvements in horse hoes.

473. H. Christie. Improvements in finishing and polishing threads and yarns.

488. T. Clayton. Improvements in machinery or apparatus for ornamenting and embossing wood, leather, paper, and other similar materials.

510. J. H. Johnson. Improvements in spinning machines. A communication.

518. W. Gossage. Improvements in the manufacture of soda and potash.

529. W. E. Newton. An improved furnace for locomotive and other boilers. A communication.

545. A. Mitchell. Improvements in harpoon guns.

547. W. Wood. Improvements in machinery or apparatus used in the manufacture of carpets and other pile fabrics.

555. J. H. Johnson. Improvements in apparatus or instruments for measuring distances and elevations. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1854.

523. Joseph Bour.
529. Felix Abate.
547. Thomas Dunn.
548. Henry Bernoulli Barlow.
550. George Beardsley.
558. William Warne.
562. James Smith.
567. William Young.
573. William Peace.
580. William Mill.
583. Désiré Parfait Lefevre.
584. Zephirin Boitteux.
612. Johnson Hands.
710. George Collier.

LIST OF SEALED PATENTS.

Sealed March 3, 1857.

2500. William Edward Newton.
2594. Louis Urion.
2785. Charles John Lewsey.
2798. Alfred Vincent Newton.

Sealed March 6, 1857.

2085. Paul Rapsey Hodge.
2087. Félix Estivant.
2103. George Tomlinson Bousfield.
2105. William Smith.
2113. John Taylor.
2128. John Talbot Pitman.
2130. Albert Demerit Bishop.
2160. Robert Elmy Garrood.
2202. William Young.
2388. Alfred Vincent Newton.
2582. William King Westly.
2814. Peter Walker.
2974. Alfred Vincent Newton.
3005. Warren A. Simonds.
40. David Baker.

Sealed March 10, 1857.

2123. James Hudson.
2129. Alexander Chaplin.
2140. John Elliott.
2143. William Whittle.
2150. Samuel Cunliffe Lister.
2154. Jean Baptiste Justin Lassie.
2158. Alexander Rowand.
2176. Antoine Andraud.
2179. Carl Heinrich Schröder.

2200. Archibald Templeton and John Lawson.
2241. Victor Frederic Antoine Prost.
2242. Robert Brown.
2256. Marius Pellen.
2285. Thomas Arthur Dillon and John Gray.
2288. William Gostwyck Gard.
2315. Peter Armand Lecomte de Fontainemoreau.
2524. William Brodie.
2694. Andrew Symington.
2761. William Edward Newton.
2781. George Salt.
2782. James Broadley.
3051. Benjamin Goodfellow.
3091. William Armand Gilbee.
3. William Rigby.
15. Joseph House.
18. John Pettigrew.
75. Robert Turnbull.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

A Subscriber from the Beginning.—The hood and pipe mentioned by you would undoubtedly prevent the evil you mention; but, as much of the steam would condense in and run down the hood, it would be necessary to provide for the removal of the water of condensation. This might easily be done by turning up the lower edge of the hood upon the inside, so as to form a gutter, from which gutter a small pipe might be led to the feed-tank.

W. Mappin.—Yours is received and shall be attended to.

A Mechanic.—Your reply must stand over for a week.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine*, must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

Errata.—Last No. (1752), page 224, 1st col., 11th line from bottom, *for* $x=r$, read $x=R$;' and 8th line from bottom, *for* $x=o$, *read* $x=r$.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

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Edited by R. A. Brooman, 166, Fleet-street.

REEVES' MACHINERY FOR SOWING SEEDS AND DEPOSITING MANURE.

Fig. 2.

Fig. 1.

REEVES' MACHINERY FOR SOWING SEEDS AND DEPOSITING MANURE.

In some descriptions of machines for sowing or depositing seeds and manures, a series of revolving coulters or pressers have been used for making the grooves in the soil in which the seed or manure is deposited; but these revolving coulters or pressers have usually been all carried by one axis, and are not therefore capable of adjusting themselves to the inequalities of the ground. Mr. Reeves, an agricultural implement maker, of Bratton, Westbury, Wilts, has obtained a patent for mounting these coulters or pressers on independent axes, and when it is desired to deposit the seed or manure at intervals, he so forms the coulters or pressers as to make indentations in the soil at suitable intervals, and places studs or inclines on the coulters or pressers, which, by acting on levers, cause the seed or manure to be deposited in the holes or indentations. When it is desired to deposit the seed or manure at intervals in a groove, and not into holes, he so arranges the machine that the groove is cut by an ordinary coulter, and the depositing apparatus is actuated by a wheel running on the land at the side.

Fig. 1 of the engravings on the preceding page is a side elevation, and fig. 2 is a plan of a frame carrying a revolving coulter and a dropping apparatus combined, according to Mr. Reeves' invention. A A is the iron frame pin, jointed at its forward end to the fork piece, B, which is carried by a bar running across the front of the sowing machine; to this bar a series of frames (with revolving coulters and dropping apparatus similar to those shown) are attached. Each of the frames carries a pin or axis, C, on which a revolving coulter, D, is mounted; this coulter is a cast-iron wheel, and it has a series of projections on its periphery, which in running over the land, produce holes or indentations for receiving the seed or manure; but the coulter ordinarily employed produces a V-formed groove in the land in place of such holes or indentations. *d d* are a series of studs or indentations formed on one side of the coulter, D: these studs, as the coulter revolves, come in contact with the end of the lever, E, which is carried by a standard attached to the frame, A. From the other end of the lever, E, a rod, F, descends, and is connected at its lower end to the short arm, G, which is attached to the axis of the valve, H, which closes the box, I. The seed or manure to be deposited is dropped at intervals into the box, I, by any of the means heretofore employed for dropping at intervals regulated quantities of seed or manure, and the seed or manure so deposited in the box, I, is there retained until one of the studs, *d d*, comes in contact with the end of the lever. K is a chain attached to the frame, A, and passing to a roller on which the chain is wound when it is desired to raise the coulters, D, off the land. The end of the frame, A, has formed on it a series of notches to receive a weight, which causes the coulters to sink further into the land than they otherwise would. Sometimes in place of dropping seed into the box, I, at intervals, the box, I, is used as a seed reservoir, and in place of the valve, H, a revolving cylinder is employed, and placed so as to close the opening at the bottom of the box, and having indentations on its surface, into which the seed falls, and this cylinder has a ratchet wheel at its extremity, which receives motion from a driver on the end of the rod, F, so as to cause the cylinder to revolve; thus the indentations on its surface become uncovered in succession, and deposit the seed which they contain in the holes or grooves made by the coulter. In place of thus giving a step-by-step motion to this dropping cylinder, it may be driven continuously by a band passing from a pulley on the axis of the coulter to a pulley on the axis of the cylinder.

HEARDER'S LECTURES ON THE INDUCTION COIL.

The interest excited by Mr. Hearder's lectures on the induction coil, at the London Institution and Society of Arts, was of no ordinary character, as was sufficiently manifested by the crowded audiences who assembled to witness the lecturer's experiments on all three occasions. The scientific portion of the metropolis had been partly prepared for some new and extraordinary results by the two interesting papers published by Mr. Hearder in the *Philosophical Magazine* in the latter part of last year; but the lectures themselves contained many new and important experiments which had not been previously made public, and which excited the greatest interest and astonishment, particularly when it became known that the lecturer had prosecuted his inquiries, invented and constructed his apparatus, and made his discoveries without the aid of sight, having met with an accident during his chemical pursuits, which deprived him of that blessing more than twenty-five years since.

As the lectures at the London Institution embodied the one given at the Society of Arts, it is only necessary for us to report those given at the former place, (which have not, we believe, been hitherto reported,) merely remarking, with regard to the Society of Arts, that the warm expressions of commendation and admiration which fell from the Chairman, W. R. Grove, Esq., Q.C., and other eminent scientific men during the discussion which followed Mr. Hearder's lecture, sufficiently showed the manner in which they appreciated the importance of his discoveries and improvements. The Chairman himself remarked that the results were of so novel and extraordinary a character, that he hardly felt at liberty to offer any opinion upon the lecturer's explanations of the phenomena without a quiet and attentive consideration of them, and that they were as new to him as they doubtlessly were to all present.

FIRST LECTURE AT THE LONDON INSTITUTION.

Mr. Hearder commenced his first lecture by a brief allusion to the facts which had induced him to take up the subject. He had been for many years engaged in the construction of an improved and powerful form of the medical coil machine, for which he on one occasion received the silver medal of the Royal Cornwall Polytechnic Institution. As far back as the year 1842, he obtained static sparks from the terminals of his secondary coils, although they had no other insulation than the cotton covering. These, in relation to the quantity of wire employed, were nearly equal in effect to those at present obtained by M. Ruhmkorff; but, although frequently tempted to try the effect of a more perfect insulation, he neglected to do so, until aroused by Mr. Grove's experiments with M. Ruhmkorff's instrument. Without waiting for any information respecting this new apparatus, Mr. Hearder proceeded to act upon his own experience, and in October, 1855, produced a machine much more powerful than the French one, with which he developed phenomena until then unknown. Mr. Hearder proceeded with his investigations, and on March 6th, 1856, read a paper at the Plymouth Institution and Devon and Cornwall Natural History Society, in which he described the construction of the instrument, and exhibited its great power. A report of this lecture appeared in the *Journal of the Society of Arts*, for May 16th, 1856, page 444. On the 17th of March, 1856, Dr. H. M. Noad lectured at the Plymouth Mechanics' Institute, and availed himself of the opportunity of comparing Mr. Hearder's machine with one of Ruhmkorff's most powerful ones, when the superiority of the former was strikingly evident. Mr. Hearder subsequently still further improved his little apparatus, and doubled its power, and in September, 1856, obtained for it the first silver medal from the Royal Cornwall Polytechnic Society. The lecturer explained the peculiarities of his induction coil, which we have given in former Numbers, and drew attention to two elegant and very complete instruments on the lecture-table, one of which would furnish sparks upwards of 2 inches, and the other upwards of 3 inches in length in free air. Their action was exemplified by a variety of brilliant and interesting experiments, most of which were original, and evidenced a profound acquaintance with the subject. On exciting the machine, torrents of long zig-zag sparks darted between the platina pointed terminals of an ingeniously-contrived graduated discharger; and on inserting combustible substances between the points, they were instantly kindled.

The important function of the condenser was then shown; for on disconnecting it, the long sparks immediately ceased, and sparks could not be made to pass over an interval of more than half an inch. The condenser being reconnected, the platina terminals were approximated to each other, and, contrary to the action of Ruhmkorff's machine, both fused and fell in ignited globules.

A stream of sparks was then made to pass, 2 feet in length, through the flames of a dozen spirit lamps, placed side by side, giving a loud crepitating noise in their passage. Sparks, from 10 to 13 inches in length, were also passed over the surface of a piece of cork and a glass plate, upon which metal filings were strewed, exhibiting in the former case a line of fire, and in the latter, streams of bright coruscations.

On connecting a large Leyden jar with the machine, a roar of brilliant discharges took place, more than half an inch in length, and on transmitting these through a mass of loaf sugar and a crystal of alum, they were vividly illuminated.

A Leyden jar, coated with diamond spots, was also illuminated with thousands of sparks; and whilst experimenting with one of the Leyden jars, the intensity of the action was such that a wooden foot in the interior, covered with tin foil, and serving to support the conducting rod, took fire in an uncovered portion, and was considerably burnt. The lecturer remarked that he had

more than once observed this phenomenon, and that the ordinary mode of constructing Leyden jars was scarcely such as to enable them to withstand the force of this agent.

A tall glass receiver, nearly 3 feet in height, was exhausted of air, and a brilliant stream of light, in the form of a crimson ribbon, pervaded its whole length.

In another receiver a large glass vase was placed, the interior of which was coated with tin foil, and from which the electricity flowed in a splendid cascade, falling upon the pump plate; and on reversing the connection of the battery, the direction of the electricity was instantly inverted, and it then appeared to flow up over the glass and in over its edge.

In concluding his first lecture, Mr. Hearder remarked, that what he had exhibited was only an earnest of what the machine would be capable of when made of larger dimensions, since the exalted effects which the Society had witnessed had not been obtained by the employment of a larger quantity of material than that used by M. Ruhmkorff, but merely by a different arrangement of it. He announced that the whole of the matter of the next lecture would consist of his own original experiments and researches, most of which have not yet been published.

The lecturer's experiments throughout were conducted with great delicacy; and if he had not at the commencement made known his loss of sight, no one would have discovered it. He was warmly applauded throughout, and most enthusiastically so at the conclusion of the lecture.

SECOND LECTURE AT THE LONDON INSTITUTION.

On this occasion the lecture theatre was even more crowded than on the former one, and the lecturer on entering received a hearty welcome. He commenced by a brief allusion to the prominent facts of his former lecture, and stated that since he last had the pleasure of addressing the Society, he had learned that the construction of Ruhmkorff's coil was totally different from his own. It certainly contained a primary and secondary coil, and an iron core; but the mode of insulation, and the manner of arranging these various elements, differed in every particular from his own. Mr. Gassiot had dissected one of Ruhmkorff's machines, and found that it was constructed merely with wire covered with cotton, and that the layers were insulated only by folds of paper, in the precise manner which he had been himself employing during the last sixteen years in his medical coil machines; hence it was easy to understand why Ruhmkorff's machine was so limited inpower.

The lecturer then proceeded to direct the attention of the Society to an entirely new class of thermal phenomena which had been developed in the course of his investigations. It had been for a long time thought that the only thermal effects in metallic conductors were those elicited by the passage of the spark from one to the other, by which means their discharging ends, when of small dimensions, were ignited and melted; and that when an extremely fine wire had been made to form any other portion of the circuit, it was not sensibly heated by the passage of the induced current through it. He had, however, found that whenever the induced current is interrupted and measured out by the Leyden jar, its thermal character is entirely altered, and it becomes capable of igniting, and even melting the wire which before conducted it with impunity. This was beautifully exemplified in the following manner:—A piece of fine iron wire was fixed between the forceps of the universal discharger, and the induced current was passed through it for a considerable time without producing any effect; whilst passing, one of the transmitting wires was brought in contact with the knob of a Leyden jar, and the fine wire was instantly melted, and dissipated in red-hot globules. The experiment was then modified by including in the circuit a thermo-electrometer, contrived by the lecturer, being an improvement on one originally contrived by Sir W. S. Harris, and for which, in 1842, the lecturer received the silver medal from the Devonport and Stonehouse Polytechnic Society. In this instrument a platina wire was suspended vertically in a reservoir of air, the expansion of which, by the heat of the wire, was indicated by the pressure produced upon a column of fluid contained in a glass tube. On passing the simple current through the instrument no rise in the temperature was observed, but on connecting the Leyden jar the wire instantly glowed with a white heat from the reiterated explosions of the jar, and the fluid rose above 180 deg. And here a new fact was observable: It had been before noticed that when the current without the jar passed between the ends of the discharger in the form of sparks, no heating effect was produced on the included thermo-electrometer, but these sparks were capable of inflaming combustible substances, such as gunpowder, &c. When, however, the jar was connected, the heating effect disappeared from the discharging interval, in which the sparks were no longer capable of inflaming gunpowder, and was transferred to the fine wire of the electrometer. To account for

these phenomena, the lecturer supposed that the current passed with a greater velocity when the jar was employed; and this opinion appeared to be verified by another modification of the experiment. The conductor which led from the discharger to the thermo-electrometer was removed, and a wet string inserted in its place, and now the heating effect entirely disappeared from the thermo-electrometer, but reappeared at the discharging interval, where gunpowder was as readily inflamed as before. The different heating effect of different parts of the current was exhibited, by causing the induced current to pass through an additional thermo-electrometer previously to its reaching the jar; and it was curious to observe, that, although the same electricity passed through both instruments, the wire of one was not at all affected, whilst the wire in the other, under the influence of the jar, was white hot.

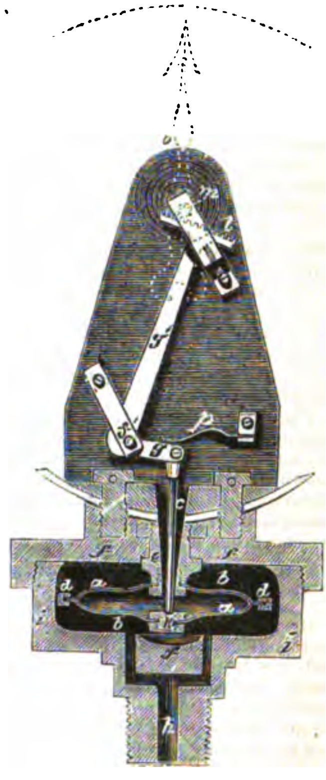
This change in the thermal character of the current with and without the agency of the jar, was admirably illustrated by a contrivance as ingenious as it was original. A thermo-electrometer and a graduated discharger were connected with the terminals of the induction coil, and a stream of sparks about one inch in length were made to pass through the included wire, but without affecting it. The lecturer drew attention to the character of these sparks; they were comparatively soft, attenuated, and flame like. Upon the front portion of the table lay a flat wooden disc covered with tin foil, exposing about five square feet of surface; about three feet above it a similar disc, also coated with tin foil, was suspended by silk strings from a frame, and attached by pulleys to a counterbalancing weight. On prolonging the terminal wires so as to connect them with these discs the conducting surface of each terminal was virtually increased, and the sparks became much brighter, but still did not affect the electrometer. The upper disc was now lowered, and the sparks became louder and louder as it descended, until, when within three inches of the lower one, they assumed the character of sparks from a jar, and the electrometer began to be affected. On a still further depression the sparks became still more sonorous, and the fluid rose several degrees, the effect being due to the charge communicated to the plate of air between the discs.

(*To be concluded in our next.*)

GRAUTOFF'S AND ALBRECHT'S PRESSURE AND VACUUM GAUGES.

The accompanying engraving represents a pressure and vacuum gauge, for which a patent has been obtained by Messrs. Grautoff and Albrecht, merchants, of Lime-street-square, London.

a a are two springs of hardened steel, the edges of which are made flat, and are hermetically sealed by a brass or other metal



ring, *d d*, clamping the two edges tightly together. In order to preserve the springs from oxydation, the patentees cover the inside and outside thereof with a solution of caoutchouc or other protective coating; or they coat the inside only, and protect the exterior by a thin sheet of brass, platinum, or other metal corresponding with the shape of the springs, which sheet metal is bent over the edge of each spring before the fixing of the clamping ring. The springs, *a a*, are placed in the space, *b*, the casing of which screws on to the part, *f f*, that supports the dial plate and mechanism for working the dial and indicator. The inner

edges of the springs, *a a*, are united at bottom to a plate, *k*, and at top to a nut, *e*, which is hollow to allow of the passage through it of a spindle, *c*, the lower end of which rests upon the plate, *k*, while the upper end is connected to a bell crank lever, *g*, which is pivoted at *f* and jointed to the long arm of the lever, *g'*. On the end of this lever, *g'*, a toothed sector, *l*, is formed, which gears into a toothed pinion, *m*, which is connected to and actuates the needle, *o*. A spring, *p*, is used to keep the rod, *c*, in contact with the part, *k*. *h* is the inlet passage for the gas, air or vapour. The steam or fluid enters by the passage, *h*, into the case, *i*, in which the springs, *a a*, are contained, and collapsing the springs causes the spindle, *c*, to rise. Or the passage, *h*, may be brought in connection with a condenser, thus causing the springs, *a a*, to extend, and the spindle, *c*, to fall, which, by means of the mechanism before described, moves the pointer on the dial, and indicates the pressure on a double index formed on the dial. The apparatus will thus become a pressure and vacuum gauge combined.

The gauge may, however, be modified, and made more suitable for vacuum or low pressure gauges, by the rod, *c*, resting on the centre of the outside of the spring, *a*; the external part of the spring is surrounded by the atmosphere, and the internal part is subjected to the pressure without the atmosphere. The centre of the opposite side of the spring to that on which *c* rests is fixed to the passages, *h h*, an opening or openings connecting the interior of the spring with them, and these passages lead to a condenser or other vessel in which the vacuum is to be ascertained.

Questions on Subjects connected with the Marine Steam Engine; and Examination Papers, with Hints for their Solution. By THOMAS J. MAIN, M.A., F.R.Ast.S., Mathematical Professor of the Royal Naval College, Portsmouth; and THOMAS BROWN, Chief Engineer, R.N., attached to the R. N. College. London: Longman and Co., Paternoster-row, 1857.

WE have, on a former occasion, expressed the high opinion we entertain of the merits of the "Marine Steam Engine" of Professor Main and Mr. Brown, which happily combines all the theoretical and practical information on the important subject of the steam engine applied to the propulsion of ships with which it is useful for officers in charge of steam vessels to be acquainted, one main excellence of which work is that it is entirely devoid of crude theories and scientific crotchets, which mar the symmetry and usefulness of most other treatises on this subject.

The great object aimed at and attained in that volume, proceeding as it does from authors profoundly acquainted with the topics they handle, is real practical usefulness without pretentious and unnecessary display of learning, which tend for the most part only to embarrass the student, and is often assumed for the purpose of concealing a real want of profundity. The object of the little volume before us, which is intimately connected with the former work, may be best explained by the preface. "On the appearance of some questions at the end of the second edition of the *marine steam engine*, it was suggested to the authors that a separate work, containing a more copious collection of examples of the same kind, systematically arranged, would be highly useful to many who have not the advantage of a tutor. To this end the authors have endeavoured to arrange the following questions in order of difficulty, and have either given partial hints, or have worked out the question in detail wherever it has been thought necessary. Examination papers also have been added, that the student may test his own acquirements; but he is recommended not to attempt them until he feels confident in his knowledge of the subject." We may add, that these examination papers are apparently selected from those which have been proposed to the candidates for certificates of proficiency in knowledge of steam at the Royal Naval College, and may therefore be fairly considered to embrace all those points on which experience has shown that the student of steam ought to acquire accurate information. We heartily recommend this series of examples as admirably adapted for the purposes contemplated by the authors.

ABRIDGMENTS OF THE SPECIFICATIONS OF PATENTS.

WE observe with pleasure that in Mr. Woodcroft's department of the Great Seal Patent Office, the publication of a series of Abridgments of the Specifications of Existing Patents, grouped in classes according to their subjects, has been commenced. Each class has devoted to it a small volume, which brings the patents from the earliest period down to the year 1856. The classes already published are "Drain Tiles and Pipes," "Sewing and Embroidering," and "Manure." The next issued, is to be "Iron Manufacture," to be followed by others as rapidly as is practicable. The object of Mr. Woodcroft, and of the Commissioners under whom he acts,

in publishing these abridgments is, to enable inventors and others to acquire at a small expense, and with as little trouble as possible, a knowledge of what has been previously done by patentees in any particular branch of art or manufacture. This they do by giving a brief abstract—as far as possible in the words of the patentees themselves—of the specifications of the inventions patented. These abstracts are necessarily brief, and in many cases represent very imperfectly the inventions described. Our own experience in this matter, acquired in the preparation of the abstracts given from week to week in this Magazine, has proved the impossibility of giving anything like a complete account of some inventions in a short compass; but our own experience has also taught us that such abstracts, although necessarily defective, are of very great use to the manufacturing classes. We are perfectly certain, therefore, that the collection of similar abridgments, in separate classes, will be of very great public utility, while used for their legitimate purpose—that of conveying a knowledge of the *chief features* of patented inventions.

CLAY RETORTS FOR GAS MAKING.

At a discussion upon the above subject, which took place at the Institution of Civil Engineers, subsequent to that reported in our last number, it was remarked that the merits of iron retorts had scarcely been fairly stated; and that although clay retorts, when well set and carefully managed, might endure twice or thrice as long as iron retorts, and the materials of these retorts, and also of their settings, were cheaper than those of iron retorts; yet on the other side of the account must be placed several important items of charge, which under certain circumstances would turn the balance in favour of iron retorts, in others render it matter of indifference which description of retort was used, and in others prove that clay retorts ought to be preferred.

Clay retorts were well adapted for generating gas from the Scotch cannel coal, which produced coke of no appreciable value; but it might be doubted whether they were in useful effect equal to iron retorts, for the distillation of coals yielding a large quantity of liquid matter, as, for instance, with coals which yielded 350 lbs. per ton of ammoniacal liquor instead of the very usual quantity of 100 lbs. Nor were they to be commended for small works, using a coal producing valuable coke, for in such works an exhauster could not be applied. It was also stated that there was no real anomaly in the law of leakage in clay retorts; for the law of the transmission of fluids through tubes was well known to be expressed the the formula,

$$P \propto av^2+bv,$$

where P is the pressure, v the velocity, and a and b two experimental coefficients. When the motion was minutely slow, as it is through capillary tubes and porous substances, v^2 became indefinitely small in respect of v, and consequently

$$v \propto P,$$

or, the quantity lost was as the pressure.

THE TOWER OF BABEL.

We learn from our American correspondence that the ruins of the Tower of Babel have *once more* been discovered. The discovery is said to have been made by M. Place, the French consul at Mosul. The letter announcing it was communicated to the Boston *Traveller*, which paper speaks for the authenticity of the statement. It is only recently, however, that Colonel Rawlinson explained to us the manner in which one pretended Tower of Babel was proved by him to be a mere religious edifice, and there is but little in the letter referred to, to inspire confidence in the veritableness of the new discovery. This proud tower, it is said, has lost, in the course of ages, its cloud-reaching elevation. Six of its eight stories have fallen into dust; but the two which remain are so high that *they may be seen for fifty or sixty miles around.* The base of the tower is quadrangular, and each side about six hundred feet long. The tower is made of bricks of the purest clay, and of a white colour, which is a little shaded with a yellow tint. Under a clear sun, and as a whole, this ancient monument of human skill and daring presents a fine blending of colors which sets the painter's *pallet* at defiance. Before being baked, the bricks had been covered with characters traced with the accuracy of the hand of a writing-master. It is a singular coincidence that M. Place discovered a subterraneous fountain at a small distance from the tower, flowing in such abundance as almost to form a river. The old fountain still pours out inexhaustible quantities of bitumen, or slime, which served the builders for cement in their vast enterprise. Among the discoveries of M. Place, were certain inscriptions on fillets of gold, silver and copper, and also upon a metal now unknown, and which has somewhat the appearance of ivory. It has been submitted to the experiments of an intelligent metallurgist, and its qualities will soon be ascertained.

A NEW DECOLORISING AGENT.

Dr. J. Stenhouse, whose improvements in sanitary and other appliances are well known, has patented a highly porous vegetable charcoal, capable of being employed as a decolorising agent. He produces it thus:—He forms a very intimate mixture of either hydrate of lime, unslacked lime in the state of the finest powder, calcined magnesia, or the light sub-carbonate of magnesia of the shops, with certain vegetable substances, such as maize, wheat, and other kinds of flour, common resin, or catophonium pitch, wood tar, asphalte or bitumen coal tar, and coal tar pitch. This mixture of lime or magnesia and vegetable matter is then heated to redness in close vessels—that is, in ordinary covered crucibles, or in cast-iron retorts, until the vegetable matter is entirely carbonized. The mixture, when cold, is then digested with hydrochloric or sulphuric acids, according as lime or magnesia has been employed, and repeatedly treated with water on a filter until everything soluble has been removed. The porous charcoal remaining on the filter is the decolorising agent.

PARNELL'S PATENT UNIVERSAL LOCK.

The year 1851 was a grand turning point in lock construction: so much so, indeed, was this the case, that all locks invented previous to that year have been regarded as old locks, and only those since invented as the new order of locks. Of these latter, however, there are not many.

One of these very locks (patented Feb., 1856) has just been selected by the authorities acting on behalf of the Board of Trade Department of Science and Art, as the most suitable for the new Museum at Brompton.

We have, therefore, been at some trouble to obtain a few particulars as to this lock, and to study its peculiarities a little, so as to enable us to give some account of it. The patentee is Mr. Parnell (Depot, 283, Strand, opposite Norfolk-street, near Temple Bar, London, W.C.) The lock selected is named the "Universal Lock," the patantee having aimed at such simplicity in construction and lowness of price, combined with new and effective modes of security, as would entitle it to be regarded as a lock for general, and not for mere special uses. Mr. Parnell is known to have been in the van of those inventors who endeavoured to give that security which the controversy of 1851 so clearly proved to be desirable and necessary. The new lock just selected by the Board of Trade does seem to be capable of fulfilling its purposes so as to obviate all idea of insecurity.—*Builder.*

ON THE FORM OF SHIPS.

To the Editor of the Mechanics' Magazine.

Sir,—I have just a few words to say in answer to the last letter of your correspondent, "H. Y. P."

The letter opens with an *argumentum ad hominem*, which might be a sophism, if it were more ingenious, and less transparent. I presume the readers of the *Mechanics' Magazine* are quite familiar with this sort of argument. With regard to pseudo improvements in naval architecture itself, I have known it appealed to some three or four times within these last three or four years. First, in behalf of the invention of M. Planavergne, who promised to coerce Nature to contradict herself, and to give us a machine fleet as Ariel and powerful as an earthquake. Next Mr. Brown designed a vessel (on the inclined plane principle, I think) which was to fly over, not plough through, the ocean. This was a scheme to make speed a special source of economy, as the resistance was intended to grow less as the velocity augmented. Mr. Lipscombe made an attempt of a similar nature. Again, Mr. Bethune publicly announced his conviction that he could build ships to attain a speed of from seventeen to twenty-five knots per hour, by a method not only different from, but in contrast with, most of the other nostrums, including those of Mr. Bland.

All these *soi-disant* improvers have used the kind of argument with which "H.Y.P." opens his letter, and with it met the objections and opposition of persons into whose professions they proposed to introduce their very questionable innovations. Yet, Sir, these objections and this opposition have been justified by the absolute failure of all their plans. Of course, the inventors themselves are at liberty to ascribe their want of success to prejudice, or to anything but the true cause. I, however, believe their designs failed from that which makes failures of so many other schemes—their worthlessness. I suppose this opinion will receive very little respect from your correspondent. He infers that my daily occupation is such as to make it imperative on me to study this subject in all its parts. The only probable effect of such a study, according to him, is to engender prejudice, and blind love of routine; so that I am thereby rendered incapable, not merely of pronouncing a judgment upon, but even of advancing an objection or an argument relating to, the subject to which he presumes I have devoted my special energies and attention. This, of course, does not harmonise with my notions on the subject. I believe it is a rare case that professional men

agree in a false application of such elementary principles of their art as are in question here. And supposing them to be right in only a small majority of cases where they are called upon to judge, and treating the question as a problem in chances,—that is, independently of all other argument,—professional condemnation, though it may not be final, affords a presumption against, not for, the proposition on which it falls.

But there is another consideration, which places my opponent in a worse category. I do not know of any case in which this Galilean logic was prominently used in support of a *good cause*, and "H. Y. P." makes it his main answer to all objections. From this fact, any one altogether outside of the dispute might conclude that either the advocate is unskilful, or his ground untenable. So far, therefore, from yielding any presumption in favour of his position, the fact which his argument implies is inimical to it.

I know that many important improvements have been made in ship building, as in other arts, by persons not regularly and professionally connected with it; but I also know that these inventors have been men who, like Bentham, gave very much more study and attention to their subjects than Mr. Bland appears, by his pamphlet, to have given. Mr. Bland is apparently ignorant of the labours of those who have gone before him, and who have followed with serious purpose, and with some success, the pursuit with which he himself is a mere trifler; and his ignorance is even made a ground for admiration, and a claim to respect. This is what constitutes Mr. Bland's "freedom from bias!"

In the second paragraph of the letter of "H. Y. P." is an implied comparison of this gentleman with Sir Isaac Newton, which I think most unfair to both parties. Even if Newton had made a series of experiments with soap-bubbles, before balloons were invented, for the purpose of investigating the power, elevation, length of flight, and safety of those machines, we could not justly make such a comparison. It would be just only on the supposition that Newton so experimentalised after balloons had been for ages constantly and fairly tested.

We are next informed that at least six improvements on the existing routine of naval architecture are put forth in Mr. Bland's book:—1st. "Increased beam;" 2nd. "Reduced average depth." These two are practically one and the same, for the one involves the other. To them in their unity I propose to direct attention after I have despatched the others, the next of which is, 3rd. "Curvilinear form longitudinally." How can this, by any stretch of fancy, be regarded as an improvement belonging to Mr. Bland? Why, ships had such a form of bottom before Mr. Bland was born; and I never saw anything but a barge having any other form of bottom. 4th. "Centre of gravity to be kept level with load water line." It is equally difficult to perceive anything new in this. I saw it, as I saw the other alleged improvements, when I looked through the book itself; but observed in it nothing new, and nothing very important. "H. Y. P.'s" citation has not added to its apparent value. Naval architects always regard the load water line as a very satisfactory height for the centre of gravity of vessels of war; and experiments which have been made have shown this to be its common neighbourhood, it being sometimes a few inches above, and sometimes as much below. This matter is spoken of as if it were as easy a thing to assign the position of the centre of gravity to half an inch on making the design, as to fix the length of the main mast; whereas if Mr. Bland, or "H. Y. P." could furnish some ready mode of doing this, they might then justly plume themselves on having performed something notable. 5th. "That a slightly convex bow is faster than a straight or hollow lined one." This is not new; it is, perhaps, as old as any of the notions I am quoting. All our old ships have convex waterlines forward, and I have known some persons advocate the adoption of such a form at both extremities of the ship. I shall not attempt to settle this point. I only say in respect to it, that Mr. Bland's experiments afford, neither to practical men nor to theorists, sufficient ground to form even a conjecture upon. There is one fact, to me significant—to Mr. Bland and to "H. Y. P." perhaps without weight—viz., that most of the fast successful vessels of late years have had, partially or thoroughly, concave bows. Lastly. "That cutting off external angles in midship sections will increase speed, but lessen stability, &c., &c." This cannot be a practical improvement, as there are no external angles on ordinary midship sections to cut off. The discovery of its truth, if there be any truth in it, is not due to Mr. Bland; and since it has no application to practice, its error is not worth contravention.

In the next paragraph I am convicted of a mistake, with regard to which I have no other course open to me than to plead guilty. Of this conviction "H. Y. P." makes a logical weapon, with which he thinks he can easily put me *hors de combat*. Yet I think the error I have made is one which he is bound to excuse. I am sorry that I endowed his sentence with a meaning not lawfully belonging to it. My mis-

take arose from an erroneous belief that it must mean something; the truth being that it has *no* signification to speak of, and none at all if it be joined to the statement that Mr. Bland recommends increased breadth and diminished depth for the vessels spoken of. We are told that the best proportion of mean draught of water to breadth is 2 to 5, and at the same time that these dimensions in line-of-battle ships are commonly 25 feet draught and 60 feet breadth. If we allow 12 inches out of the draught of water for false keels, we have the ratio of depth to breadth 24 to 60, or 2 to 5. These numbers, therefore, represent the actual ratio of depth to breadth in first-rate men-of-war. How, then, can Mr. Bland be said, in recommending them, to propose an improvement? And how can he be regarded as advocating an innovation in this particular? It seems, I quite overlooked the supposititious and impracticable rectangular midship section—to be 60 feet broad, and immersed to the depth of 12 feet. It was rather fortunate than otherwise, for its author, that I did so. Such a form is incompatible with strength; it is not adapted for the screw, as the immersion would be so small as to prevent the use of a propeller of a sufficient diameter; nor would it permit the machinery and ammunition to be stowed at a sufficient distance below the water's surface. Again, these dimensions would give the immersed area of midship section equal to 720 square feet. In a line-of-battle ship, of ordinary length and form, this is obliged to be half as much again. Indeed, 720 square feet would not give sufficient displacement, unless the length were much greater than is common, or the bottom of the vessel made in the very simplest form of a square box. Thus, Sir, if this sentence was made ridiculous by a false interpretation, it appears still more so when rightly understood.

In the next paragraph the writer alludes to an inconsistency of which he fancies I am guilty, but which I am quite unable to perceive. He says, I begin "by saying Mr. Bland pretends to only one improvement (increase of beam) while now I give him credit for a second and a third." This is quite a mistake. I said, that I "found in the book only *one proposal* pretending to be an improvement," and I said also that he "tested" several kinds of models as to speed and stability; and there is no contradiction between these two statements. There certainly is, as I have already acknowledged an *error* in the former, for "H. Y. P." has convinced me that his *protégé* proposes no improvement at all.

"H. Y. P." thinks I have outraged ordinary courtesy in my treatment of the experiments of Mr. Bland. I have condemned the models, because of their microscopic dimensions, and their rude form; and he places me on the horns of a dilemma by introducing the models of the Admiralty into the dispute. It cannot be pretended that the Admiralty models are made as those objected to, though they are as small. But I think it is pretty clear that I objected, not to smallness in the abstract, but to small rude models being applied to such a purpose, and to making them the ground of such inferences. This objection, therefore, has nothing to do with models of a different character intended to serve a different end. I might give many illustrations from the experiments themselves to enforce the importance of my objection; I will, however, content myself with one taken from those on stability in chapter 4. Take the first and third models, both 15 inches long and 2 in. deep, but No. 1, 3 in. wide, and No. 2, 6 in. wide—just double. The weight of the smaller of these is given as 1 lb. 8 oz., that of the other 2 lbs. 13 oz., and we are told that both of them float immersed to the depth of one inch. If this last fact were correct, the two pieces of wood must then be of the same specific gravity; and since the one is double the size of the other, it should be double in weight also. But the one weighs 24 oz., the other 45 oz. That is, the latter in one part of the table falls 3 oz. (out of 45) short of the weight which is given it in the other. This difference is not taken into account when the experiments are distilled into laws, though the weight of the floating body must naturally be a very important element in the determination of the stability. This is the sort of error made in these rough trials in a weight of 45 oz.; what would it be when the weight is multiplied to five or six thousand tons?

It is thought odd that I can see any marks of ingenuity in what I politely term "stuff" and "worthless." It is, however, not uncommon to find traces of misapplied ingenuity in productions neither dignified nor valuable. As to my politeness, I have only to say, that I judge of a book exactly as of any other commodity for which I have to pay, and without any reference to the author, whether he be a neighbour or the man in the moon. I have expressed nothing having a personal reference to Mr. Bland,—nothing passing the bounds of fair and honest criticism. I have said my thought in regard to the book, as I would of a piece of timber, or a mechanical tool.

I must now notice the way in which my criticism on the experiments relating to resistance is met. Some of the difficulties under which I laboured are explained away; but

your correspondent, while he smiles at my dulness, must remember that all readers may not possess the same facilities as himself, for acquiring the key to the mysteries contained in Mr. Bland's book. He has satisfied me as to one set of questions, but his answer has given rise to another set not so easy to solve. It is not attempted to explain what is meant by the 1⅛ of lever, and the difference of 2 oz.

It will be seen by a reference to my former letter, that the models tried, two and two, were of the same length. Hence, if when each pair was tried, the lighter was loaded to equalize their weights, they must have had the same displacement, and therefore the same immersed section. Now, it is quite impossible that such experiments could indicate the manner in which the resistance varies with a varying section, unless the absolute force of traction were noted in each case. Without this course, which seems not to have been pursued, they could go no further towards proving the law deduced from them than to show that equal sections at equal speeds meet with the same resistance! And this is a very little way indeed! In fact, the explanation given leaves the matter apparently inexplicable.

It is said that my *mode of reasoning* in the case of two floating bodies placed end to end is applicable when they are placed side to side. There is, however, just that difference between the two cases which makes the argument, though just in the one, utterly out of place in the other. When placed end to end, and deflected through equal angles in the same direction, the motion and the sum of the moments will plainly be exactly the same, whether the bodies be united or not, as they move about the same axis in both cases. But if placed side by side it is equally plain that they could not move in the same manner when rigidly connected, as when detached; for when separate they move about two different axes, but when secured together they must revolve about a common axis.

"H. Y. P." says, "the stability increases almost as the cube of the breadth." This is not Mr. Bland's result; he makes it vary with the breadth in almost the same way as with the length.

I have no time, and you, Sir, no space, to enable me to say anything at present about the concluding remarks of the letter. The experiment for the discovery of the centre of gravity is an attractive subject, but as I quoted it in the author's own words, I think I may safely leave it to speak for itself. It would be a convenient experiment for the operator, for I have no doubt it would find a centre of gravity for him wherever he pleased, — in the main top or in the main step, just as suited his taste.

In conclusion, permit me to assure your correspondent, of what I need not remind you, Sir, that I have an undoubted right to the *title* of

Yours, &c.,

A MECHANIC.

MR. MALLET'S WORK ON THE "CONSTRUCTION OF ARTILLERY."

To the Editor of the Mechanics' Magazine.

SIR,—I have to thank you for pronouncing judgment on the matter in dispute between me and the "Civil Engineer."

I endeavoured to state the nature of his argument from memory, but I have no doubt that your statement is more accurate, and as it is admitted that his conclusion was erroneous, I am indifferent as to whether the fallacy lay in the premises or in the reasoning.

I do not blame the "Civil Engineer" for withholding his assent to any proposition which I had not proved to his satisfaction, but I do blame him for asserting that my conclusion was false, merely because he did not know how I had arrived at it.

I admit that my note might be justly accused of obscurity if it had been intended as a didactic treatise on mechanics; but it was merely intended for Mr. Mallet's use, as an approximate calculation of the resistance offered to internal pressure by the tension of loops, the nature of these loops being supposed to be too well known to require explanation.

There is one point, however, on which you still appear to misunderstand me. I never said that a cylinder, such as you describe could bear a pressure $= 2\frac{1}{4}$ T; if it were theoretically perfect (consisting of an infinite number of shells) it could only bear a pressure$=2$ T, and I said, that this is more than double of the pressure which will burst any simple tube of finite thickness; but I did not mean to say that the actual tube with its necessary practical imperfections could bear this pressure. If my words conveyed this meaning, they certainly require to be corrected, for I do not think that in practice this tube could be made to bear a pressure more than $1\frac{1}{2}$ T, taking into account the difficulty of putting on the successive cylinders with the exact tensions required. The best practical rule would be to calculate the thickness and tensions of the tube for a much greater pressure than it is intended to bear, and to be careful that the tension with which each shell is put on, shall be *less than* the calculated tension; for a small error in excess might burst the tube before any internal pressure was applied.

In conclusion, I have to return thanks for your kindness in affording me so much space in your valuable Magazine.

I am, Sir, yours, &c.,

S. Hart.

Trinity College, Dublin, March 9, 1857.

THE ROYAL CORNWALL POLYTECHNIC SOCIETY.

To the Editor of the Mechanics' Magazine.

Sir,—The few remarks on this society, which appeared in No. 1743, are characterised by "A late Secretary" as "so many representations," "totally devoid of truth," and, lest they should by remaining uncontradicted, injure "one of the most useful of our existing institutions," he favours your readers with "a few facts in reply." On perusing his letter, however, I am at a loss to discover on what grounds he considers a series of round denials as so many facts. In support of my statements, he might have culled from the reports of the society, *facts* in abundance; but, having neglected to do so, I will supply the omission—with a due regard to the crowded state of your columns.

"A late Secretary's" statement that I could not have perused the society's report of the last meeting, was quite uncalled for. I nowhere alluded to the *society's* report. I perused a full report in the *West Briton;* and, judging from previous years, the newspaper report is a much more complete affair than anything issued by the society. To prevent all cavilling on this point, however, I will refer more especially to the report for 1855, which, by dint of great industry, the society has managed to bring out.

1. "The Royal Cornwall Polytechnic Society has not *lately appealed to the public for assistance.*" Now, on page 9 of the report, there is this, "*Resolved*, That a general appeal be made to the county to assist the society in carrying out its objects." Again, in August last, there appeared in the *West Briton*, an advertisement, signed by the honorary secretaries, containing a paragraph, thus:—"A general appeal having been made to the county to assist the society in carrying out its objects; donations will be received, by favour, at the different banks." With these *verbatim* extracts, I will leave your readers to judge whether "A late Secretary" is correct.

"As far as its funds are concerned, it is in a healthy state." On examining the treasurer's page, this "healthy state" is found to consist in an apparent balance of nearly £34 in favour of the society. To produce this balance, credit is taken for subscriptions in arrear; and, what is infinitely worse to the credit of the society, a serious misappropriation of funds has taken place. A sum of £40, subscribed as "a fund towards premiums for improved ventilation in Cornish mines," and which the society held, in the light of trustees, towards a specific object, has been appropriated towards the general expenses of the society. Having appropriated this trust money, in part or wholly to other purposes than those intended by the donors, it is not surprising that hitherto the premiums for improved ventilation should have been withheld, on the plea of "insufficient merit."

2. In reference to my statement that the society "prides itself on having rewarded, with the sum of £10, a clumsy substitute for the system of lowering and lifting miners in use in the English and Welsh coal mining districts," I must make the following extract from the report for 1834, page 24, "The premiums for the plans, for facilitating the ascent and descent of miners, were rewarded in the following manner:—The first, of £10 10*s*., to Mr. M. Loam. The second, of £7 7*s*., to Capt. W. Nicholas. The third, of £4 4*s*., to Capt. W. Richards."

Now it may be well for me to mention, for the information of intending exhibitors, that the apparatus eventually adopted is the one rewarded with the seven guineas, the second best in the opinion of the society; so much for the judgment displayed in awarding the premiums. Allowing the correctness of "A late Secretary's" statement about the 500*l*. and 50*l*., how stands the question? To the inventor of the apparatus the society awarded 7*l*. 7*s*.; to the mine which first adopted it they gave 500*l*.; to the engineer who superintended its erection they gave a gratuity of 50*l*. A glance at this shows the contemptuous manner in which the inventor is treated by the society, the liberal manner in which they can award a person who possesses just sufficient skill to erect an apparatus, for which any mine carpenter would have been competent, and the extragavant manner in which they paid one of the richest mines in the county to adopt the invention. If the apparatus is other than clumsy and inefficient, it is strange how such wealthy mine owners should require a sweetener of 500*l*. to induce them to adopt it.

"A late Secretary" is very wide of the mark, when he assumes that I know nothing of the existing differences between working a Cornish mine and a colliery. I am acquainted with, and have worked in both, which is a sufficient guarantee for my keeping to considerations of a practical nature.

In answer to the assertion, "that *the me-*

dal is given on the condition of the invention becoming public property, is as untrue as the other statements," I would refer to the regulations for competition. "No person shall be entitled to a prise for any article that has been patented or registered, or of which a description has been published, or for which a premium has been obtained from any other society, nor for any article which has appeared at a previous exhibition, unless some improvement has been made in it." I should be glad of "A late Secretary" showing how an invention is not to become public property under such circumstances as these.

The statement that "A premium of 100*l.* *was offered in the last year's list of premiums*, and I suppose it is continued, and not of 10*l.*, as stated, for a mode of ventilation applicable to Cornish mines," is wholly devoid of truth, and no one knows this better than "A late Secretary." At page 2 of the list of premiums we have these offers: "Two premiums, one of 50*l.*, and another of 25*l.*, to be given to the first and second best of the two mines in which, under the circumstances of the case, the ventilation shall be most complete. * * * A premium of 10*l.* for the best model, and a premium of 5*l.* for the best plan, for increasing the ventilation of mines." Here again, it will be seen that the inventor of a new and meritorious plan is offered 5*l.* for the use of his brains, while ten times that sum is to be given to the mine which adopts such an invention. It appears, indeed, that for doing their duty, that is, for supplying their workmen with a little fresh air occasionally, mine proprietors are to be largely rewarded, while the inventor of an apparatus to save and prolong life is to be paid off with 5*l.* The "premium of 10*l.* for the best model," shows the astounding ignorance which guides the councils of the society. In the name of common sense, what has the quality of the material in, or the workmanship about a model to do with the ventilation of mines?

Instead of the Cornish mines being unhealthy, "there are no mines in the world in which to such extreme depths general ventilation is so perfect." Such is the opinion of "A late Secretary;" but on turning to page 12 of the report, we find, "It is notorious that mining operations are not unfrequently suspended, from the impossibility of the men working in so foul an atmosphere as they sometimes encounter (and this is a result which never ensues until after an immense amount of suffering, and even loss of life has occurred in attempting to prosecute the work); there are pitches in some of our best conducted mines, where it requires the labour of sixteen men to drive an end, in an atmosphere so impure that they cannot exist in it for more than from five to ten minutes, which two men could effect if a supply of wholesome air could be kept up when they are working." If this is the condition of the atmosphere in the best regulated mines, what are we to think of the worst conducted mines, and the unfortunate beings who labour in them? Where are we to look for a parallel case to this? We may find deeper mines, but worse ventilated do not exist. To speak of ventilation in Cornish mines, however, is a misnomer; for in the entire county there is not a single mine where one foot of air is supplied to the men, other than finds its way naturally, and in spite of the innumerable obstacles which seem placed intentionally to arrest its progress.

Of the usefulness or otherwise of the society, some opinion may be gathered from the report alluded to. The expenditure for 1855 was £370 13*s.* 11*d.*—a sum sufficiently large for a corresponding liberality of premiums, but the total paid as prizes amounts to £85 10*s.* only; and of this the small sum of £7 10*s.* is all that went towards originality of invention in the mechanical department. A further sum of £9 was given for workmanship of models, and £5 odd for mechanical drawings. Although issued as the "society's" report, it appears, in reality, to be a report of Mr. R. Hunt's lecture at the meeting; for while Mr. Squires' lecture is dismissed with three lines, the former secretary has monopolized *seventeen pages* for a report of his lecture, besides other space. I observe, also, that Mr. Hunt drew up the report on the mechanical department; though why any one single individual should have this power delegated to him, is more than the uninitiated can understand. Instead of plates of the inventions rewarded by the society, we have eight plates copied from the report of the British Meteorological Society. If a person should turn to its pages for a description of any one invention or apparatus, he would be most wofully disappointed. In the mechanical department £3 was awarded for an improved spirit level; but in this, as in all other cases, we are without one word of information as to the nature of the improvement. We are told that £3 was awarded for the improvement, and that is all the information vouchsafed to the public by this very "useful" society.

I must set "A late Secretary" right on one point. I am not a disappointed competitor. I exhibited at one, and only one meeting, and then obtained the society's silver medal—the highest reward they have it in their power to bestow. With this admission, your readers will see that these remarks are not prompted by a disappointed spirit.

With a cash balance of £30 odd, the society is accustomed to offer prizes to the amount of £200 annually, in addition to those ordinarily bestowed; but lest any poor inventor should aspire to obtain prizes which the society have not the wherewith to pay, I will mention the following in connection with its mode of doing business. In 18— an engineer wrote to the secretary for information as to the conditions of competition for one of the prizes offered by the society. A reply should have been received the following day, but was delayed by the secretary full a fortnight; and then he coolly drew the applicant's attention to the fact that he was too late, by a day, to compete for the prize. It seemed rather strange that he should have delayed replying until the reply was no longer of any use; but at the meeting the whole became clear. The secretary himself was an exhibitor for this prize, and by dint of keeping out other competitors in the manner described, actually carried off the only prize given in the class.

I am, Sir, yours, &c.,
COSMOPOLITAN.

March 14, 1857.

MR. LOSEBY AND THE WESTMINSTER CLOCK.

To the Editor of the Mechanics' Magazine.

SIR, — I confess I am surprised — which I am not easily — at Mr. Loseby's final audacity in declaring, notwithstanding all the fabrications he is convicted of, that his last and former letters " do not contain any statement from first to last in which any inaccuracy occurs, even through inadvertence."

Perhaps the omission of the one word "*even*" would make this statement true. How true it is without that omission shall be judged of by the very first fact I find stated in his last long letter; which is, that, " according to the contract, the [Westminster] clock is to strike the quarters on four quarter bells of the aggregate weight of the hour bell."

There is only one word in the English language by which a deliberate statement such as this can be properly described. For there is no such contract, nor ever was: there is no such intention, nor ever was—at least by the only person whose intentions can affect the question, that is myself. It is not the fact, and indeed it is not possible now, that all the quarter bells together will or can weigh a single ton more than *half* the weight of the hour bell.

Neither is it possible to sink Mr. Loseby lower by any conceivable amount of exposure. To go on answering such a man, who invents new falsehoods at every step, would be as absurd as to go on trying a man for more forgeries after he had been convicted and transported for life. Henceforth, therefore, Mr. Loseby may write as many letters as anybody will print for him, with no more notice from me than if they were dated from Newgate instead of Islington.

I am, Sir, yours, &c.,
E. B. DENISON.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

HERTS, A. *An improved sheet metal bending and tubing machine.* (A communication.) Dated July 8, 1856. (No. 1610.)

The patentee describes an apparatus for rolling up sheet metal into tubes or other curved forms, suitable for stove pipes, speaking pipes, &c., consisting chiefly of a mandril working in a cylinder.

SHORT, S. *Certain improvements in horse shoes and shoes for other animals.* Dated July 8, 1856. (No. 1613.)

To a shoe of the usual figure is added a rim that extends up over the hoof sufficiently to hold it on without nails. This rim springs off enough to put the shoe on when it is brought up to its place and fastened. A piece of India-rubber can be fitted to the sole for the hoof to rest on, and to aid in the adjustment.

FISHER, D. *A composition for coating metal, plates, or wheels, used for grinding, sharpening, or polishing.* Dated July 8, 1856. (No. 1615.)

Corundum, or adamantine spar, in a state of pulverisation, used alone, or mingled (for economy) with crystallised quartz, &c., is mixed with plastic and glutinous substances, such as rosin, oil, shellac, reduced to a melted state.

ADAMS, W. B. *Improvements in railway wheels, axles, and axle boxes.* Dated July 9, 1856. (No. 1616.)

This consists—1. In accurately boring the tyres and turning the wheels to gauges so that they may be forced on by pressure, or shrunk on with a low heat, to avoid straining the iron. 2. In securing the wheels to the tyres by means of expanding hoops of a conoidal or conical form.

BODMER, R. *Improvements in self-acting apparatus applicable to certain kinds of machines for spinning cotton and other fibrous substances.* (A communication.) Dated July 9, 1856. (No. 1618.)

This relates to mules, and refers—1. To a mode of connecting the driving pulley with the front roller, having for its object the disengaging of the front roller during the putting up of the carriage. 2. To cer-

tain mechanism for effecting the "backing off" and "putting up."

HOLROYD, W., and W. NOBLE. *Improvements in machinery or apparatus for cutting wood and stone.* Dated July 9, 1856. (No. 1620.)

This relates chiefly to the employment of a cam or pattern wheel as the means for governing the movements of the cutter, so as to obtain the desired deviation from a straight line in the direction of the cut.

JEROME, T. *Certain improvements in buttons for ornamenting and fastening dresses, as also in loops for attaching or holding buttons on garments while in use.* Dated July 9, 1856. (No. 1622.)

This invention comprises methods of making a great variety of buttons, including fancy, shirt, vest, trousers, and metallic loop buttons.

WILLIAMSON, A. W. *Improvements in obtaining the rosin and sugar of scammony.* Dated July 9, 1856. (No. 1623.)

The roots of scammony are gronnd, placed in a vessel, and have the vapour of alcohol passed through them. The condensed product is evaporated till it is left of the consistence of treacle, and washed with water, which, being evaporated, leaves the sugar of scammony; the residue, when washed, contains the rosin, which is heated and dried.

ROBERTSON, W. *Improvements in machines for spinning and doubling cotton and other fibrous substances, such machines being of the kinds commonly known as mules and twiners or doublers, and in the means of weighting rollers in the same and other machinery.* Dated July 9, 1856. (No. 1624.)

This invention comprises ten several improvements, none of which can be described without illustrations.

DEFRIES, M. *Improvements in moderator and other lamps.* Dated July 9, 1856. (No. 1626.)

The oil vessel is so constructed that the interior thereof may be readily cleansed, and again put together, and the rising or supply tube descends to, or nearly to, the bottom of the oil vessel, so that spurting of the oil, consequent on air getting under the piston, is prevented.

KAY, R. D. *Improvements in machinery or apparatus for pressing, straining, sifting, or refining colours and thickened mordaunts.* (A communication.) Dated July 9, 1856. (No. 1627.)

The patentee uses a case or cylinder in which a piston is worked, to press the colour through a cloth made of cotton, linen, hair, or wire gauze.

EADON, R. T. *An improvement in the manufacture of band saws and other endless bands or hoops of metal.* Dated July 9, 1856. (No. 1628.)

A bar or rod of cast steel (or other suitable metal) is bent into a circular form, and the ends thereof welded to a perfect joint; then the bar is reduced to the thickness required between rolls.

MARSH, J., and J. CATT. *Improvements in the manufacture of certain textile fabrics.* Dated July 10, 1856. (No. 1631.)

The patentees employ a warp lace machine, in which needles, sinkers, and guide bars are at present used for the making of lace and hosiery, and apply thereto other bars to which are attached forks for operating on the warp threads and traversing them diagonally from side to side. The bars carrying these forks are operated upon by wheels or by a jacquard. The warp threads are kept separate by stumps, from which they take on to the needles to lap and form loops. The work is then knocked over by means of pressure. By the addition of another bar in conjunction with points to operate upon the warp threads a great variety of patterns may be produced.

PRINCE, P. *Improvements in moulds for casting railway chairs and other articles.* Dated July 10, 1856. (No. 1632.)

Any convenient number of patterns of railway chairs (or other articles) are attached to a turn over plate, fixed by joints on one end of a bar which rests on a bearing joint, and, after the moulding, raises the whole from the mould.

HARDACRE, S. *A compound conical spike and spiral double gridded machine for opening, blowing, scutching, and cleaning cotton, wool, and other fibrous substances.* Dated July 10, 1856. (No. 1633.)

This invention consists in the use of conical rollers furnished with spikes or pins and spiral beaters mounted on a suitable framing, so that the cotton, wool, &c., will be fed into the first cone and given out at the last, having been perfectly cleaned and opened by the centrifugal action of the spikes and beaters within concentric cases.

LANCASTER, C. W. *An improved method of, or apparatus for, inking, printing, or stamping surfaces.* (A communication.) Dated July 10, 1856. (No. 1634.)

An inking roller is mounted upon an arm or lever in such manner that, when the stamping or printing surface is at rest, the roller is held clear thereof, and that when the printing surface moves, it acts upon the lever, presses it back, and causes the inking roller to traverse over, and ink, the printing surface.

FOWLER, J., jun., and W. WORBY. *Improvements in machinery for ploughing and tilling land by steam.* Dated July 10, 1856. (No. 1635.)

Two drums or capstans, with upright axes, are, with a steam engine, mounted in a frame on wheels, to be moved progres-

sively on the land. The capstans are so worked by the engine that they may alternately wind up their wire ropes, so that whilst one is being driven the other is running free, and unwinding its wire rope. The pulley or apparatus from and to which the plough is drawn is moved at the other end of the land, to coincide with the movement of the carriage, &c. Or two carriages may be used, each with one upright barrel or capstan. The mould boards of the ploughs used are in some cases combined with rotating harrows, so that the mould boards raise the land over the teeth of the rotating harrows, which work and break it up. In some cases also the patentees use as an anchor, a carriage with disc wheels, which cut into the land at right angles to the plough's motion. The ploughs are moved to and fro between the anchoring carriages by wire ropes and pulleys, receiving motion from capstans or drums and a steam engine anchored as above.

SAXBY, S. M. *Improvements in ascertaining the errors of mariners' compasses.* Dated July 10, 1856. (No. 1636.)

The object is to remedy the evils of local attraction, and to apply the same invention to the simplifying of the art of navigation and nautical astronomy generally by diminishing the necessity for calculation. A spheric diagram made of transparent substance is placed upon another spheric diagram, one turning upon the other, thus causing the intersection of the lines drawn upon each, by which it is easy to measure sides and angles of triangles.

LEADBETTER, R. H. *Improvements in the preparation of flax.* Dated July 11, 1856. (No. 1637.)

Flax straw, after being digested in hot water, is steeped in flax steep water of 80° or 100° for about four days, and is then rolled, dried, and scutched as usual.

HARRINGTON, R. *Improvements in umbrellas, parasols, walking sticks, whips, &c.* Dated July 10, 1856. (No. 1638.)

Iron or other metal tubes are formed into hooks or handles, &c., for the ends of the tubes or sticks of umbrellas, parasols, &c., and are afterwards japanned, or otherwise ornamented.

WESTWOOD, J. *Improvements in hand, roof, and other railway lamps, parts of which are also applicable to certain descriptions of oil lamps for general purposes.* Dated July 11, 1856. (No. 1639.)

The lamps named are so constructed that they shall not be subject to leakage, smoke, and derangement. The improvements cannot be described without illustrations.

CHARLTON, T., and W. TURNBULL. *Improvements in steam generators.* Dated July 11, 1856. (No. 1640.)

Boilers are formed with two main compartments, one over the other, connected by suitable water ways or passages; in the lower compartment are placed tubes, the whole of which are covered by water supplied to the upper compartment, which is maintained filled up to about one-half or two-thirds of its height. The fire-box is formed with double flat sides, and with a double-arched roof, water ways being provided between the thicknesses of the sides and roof. The invention further consists in pumping water from one boiler into succeeding stronger boilers, and finally into a boiler in which the steam is to be generated, whereby steam of very high pressure is obtained.

DEMBINSKI, G. H. *An apparatus giving a self-acting motive power, produced by weight, elasticity, compressed water, or any gas whatever.* Dated July 11, 1856. (No. 1641.)

A continual motion, reproductive of itself (!) is to be produced by two wheels connected by gearing, or endless chains or ropes, the motion being produced either by weight or by air, gas, compressed water, &c.

CHEVALIER, J. B. D., and N. R. O'SULLIVAN. *A new or improved method of obtaining or preparing printing surfaces, and in printing therefrom.* Dated July 11, 1856. (No. 1642.)

By this invention the different colours of a design can be printed at the same time. The patentees take any suitable permeable substance or fabric, such as linen, &c., or it may be a reticulated metal surface or perforated metallic plate, and on it draw the desired figures in an ink composed of lamp black, indian ink, gum, sugar, and salt. They next coat the substance with a thin coating of gutta percha (or gelatinous material), then dry the coating and wash it. The gutta percha, where it comes in contact with the permeable material, adheres thereto; but the ink, being soluble in water, is removed in the washing, and carries away the gutta percha covering it. The back of the fabric is now coated with the ink or colours to be printed, and the impression is taken from the face of the fabric by pressure in a press; the ink or colour passes through the pervious part on to the paper or other surface.

MONCKTON, E. H. C. *The application of a means or process for destroying grubs and other insects or animalculæ or infusoria injurious to plants.* Dated July 11, 1856. (No. 1643.)

This consists in generating carbonic acid gas or chlorine gas, for which a suitable escape is provided, whereby it is emitted and poured over the ground around the plants.

WORNUM, A. N. *Improvements in grand pianofortes.* Dated July 11, 1856. (No. 1644.)

This relates to grand pianofortes in which the string is struck from the top. It consists, 1. In the use of a spring attached to the end of the key, and acting on the end of the crank lever, so as to keep it always in contact with the end of the key. 2. In a method of arranging the button which acts on the hopper so as to raise it from the hammer as the hammer approaches the string, in order to facilitate the adjustment of the bottom from the top. 3. In a method of obtaining a rapid repeat.

ORTET, B. F. *A new metallic composition applicable to the coating of surfaces, and to the moulding and casting of various objects.* Dated July 12, 1856. (No. 1645.)

Iron pyrites are treated either alone or in combination with products containing sulphur, by which is produced a substance called ferreine, which is susceptible of being moulded, and which he applies to the manufacture of cisterns, basins, pipes, pavement, &c.

HARTWELL, T. M., J. W. and H. GLADWIN. *Improvements in machinery or apparatus for stretching woven fabrics.* Dated July 12, 1856. (No. 1646.)

Instead of the usual pins the patentees employ endless clamps passing over guide pulleys and between side guides, the space between the pulleys and guides being regulated by right and left-handed screws as usual. A self-acting apparatus works the clamps.

ADAMS, W. B. *Improvements in the permanent way of railways.* Dated July 12, 1856. (No. 1647).

These improvements cannot be described without illustrations.

POPE, J. *Improvements in the application of steam power to ploughing and other agricultural purposes.* Dated July 12, 1856. (No. 1648.)

A light locomotive engine is mounted on broad wheels having projections to hold the ground, and afford sufficient bite for traction; the breadth prevents sinking. The ploughs are attached by traction bars or chains, in sufficient number to plough at one time the breadth covered by the wheels. The ploughs are one in the rear of the other, the second plough throwing the land into the furrow made by the first, and so on. Other implements may be attached.

PETRIE, W. *A new porous material for filters and other like articles, and for certain modifications or improvements in the manufacture of the material whereby it is adapted to the formation of vessels of capacity, to be employed as a cement, as a water and acid proof lining, as a preservative coating, and as a substitute for stone and earthenware.* Dated July 12, 1856. (No. 1647.)

The principal feature is as follows:—For filters and porous articles the patentee takes silicious sand, well dried by heat, and mixed with about one-fourth of its weight of powdered sulphur. This he rubs and stirs in a shallow dish, heated so as nearly to cause the sulphur to ignite; and when the ingredients become of a consistence like damp sand, he pushes them off into a dish of lower temperature, but hot enough to preserve the allotropic or brown and viscous state of the sulphur, and in this also they are rubbed and stirred. The mixture is then moulded in a perforated mould, and has cold water thrown upon it, so as to sink through its pores. The patentee describes modifications of this process.

HERTS, A. *Improved apparatus for holding material during the operation of sewing.* (A communication.) Dated July 12, 1856. (No. 1650.)

Two plates of metal of bivalve configuration, are united and work on a hinge near their centre. By closing them on one side the opposite side is opened to permit the insertion of one end of the material to be sewn between the plates, which then close and hold it. The apparatus may be screwed to a table.

AVERY, J. *An improved "plate holder" for photographic and other purposes.* (A communication.) Dated July 12, 1856. (No. 1651.)

The form of the plate holder cannot be described without illustrations.

ROWLEY, J. *Improvements in the manufacture of a material as a substitute for leather.* Dated July 12, 1856. (No. 1652.)

This relates to improvements upon a patent of the patentee, dated April, 1854, No. 892, and consists—1. Of a mode of uniting the materials of which the substitute for leather is made; and, 2. In the use of certain materials not heretofore employed for uniting a felted or woven fabric with paper.

RASSANT, P. B. *A new mechanical contrivance for transforming an alternate into a continuous circular motion.* Dated July 14, 1856. (No. 1653.)

A frame is connected by chains to wheels simply set on the main shaft, and curved levers cause the wheels to communicate by means of eccentric cylinders and small cranks, with pieces secured to the driving shaft, which is carried constantly in the same circular direction by the tractive power of the chains.

BURRELL, C. *Improvements in arranging and rendering portable apparatus suitable for distilling from beet root and other vegetable substances.* (Partly a communication.) Dated July 14, 1856. (No. 1654.)

The improvements consist in combining a suitable still and refrigerator with wheels, so that the whole apparatus for distilling

may be moved from farm to farm. The distilling leaves the residual vegetable substances suitable for food for cattle. The still is arranged with a series of trays, which in working are introduced at the upper part of the still, and taken out at the lower part. The beet roots being first cut in pieces, are fermented, and placed on the trays. Steam is admitted at the lower part of the still, and as one lower tray is removed with the spent matters thereon, a fresh tray is introduced at the upper part, and thus the process is continuous.

NEWTON, A. V. *An improved mode of securing the plastering of ceilings and walls.* (A communication.) Dated July 14, 1856. (No. 1656.)

The object is to cause the first layer of plaster to adhere as firmly to the laths as the second layer does to the first. To the joists or girders, or to a ceiling of boards, are applied laths having inclined edges forming an angle with the horizontal plane of the floor, to which the mortar is to be applied, and spread on in the usual manner, so that the tongues of mortar which pass between the laths form an angle with the floor, and overlap the tops, and are clinched thereto.

WILLIAMS, W. *Cutting and dressing stone by machinery.* Dated July 14, 1856. (No. 1657.)

The stone is cut by metal cutters revolving on an axis, which successively cut the block moved forward to them according to the shape which may be required.

LUCAS, J. L., and A. DE BRIGES. *Improvements in preparing certain liquid or solid alimentary substances from the husk of a certain fruit.* Dated July 15, 1856. (No. 1658.)

The outer shell or husk of the walnut, is rapidly torn up, pressed immediately, and the juice placed in contact with a solution of sugar. Fermentation soon takes place.

CLIBRAN, W. and J. *Improvements in apparatus or mechanism for regulating and measuring gas.* Dated July 15, 1856. (No. 1660.)

This consists—1. In combining a "gas regulator" with a "gas meter;" the water in the regulator is in communication with that in the meter. 2. In arrangements which will render practically impossible the filling of gas meters with water above the correct level.

WATT, W. *Improvements in the manufacture of starch.* Dated July 15, 1856. (No. 1661.)

The patentee takes maize or Indian corn whole, steeps it in water, at a temperature between 70° and 140° Fah. for about a week, changing the water frequently. A certain amount of acid fermentation is thus produced, and the particles of starch and the husks are afterwards easily separated. The swollen corn is then ground in a current of water, and the pulp produced sifted in sieves, the starch and water passing through. The starch, on standing, subsides from the water.

NEILD, A. *Improvements in Jacquard and other pattern looms.* (A communication.) Dated July 15, 1856. (No. 1664.)

Certain machinery (which requires to be illustrated by engravings) is connected with the Jacquard or other pattern apparatus for arresting or retarding the taking-up motion, to cause a greater or less number of picks to be driven in at any required part of the cloth.

JOHNSON, J. H. *Improvements in apparatus for consuming smoke, to be applied to lamps and gas burners.* (A communication.) Dated July 15, 1856. (No. 1665.)

An inverted funnel of glass (or other such material) is suspended over the chimney of the gas-burner or lamp by a cross bar or strap attached to its neck and secured to a rod, which also supports a metal bell placed over the open top of the funnel. In the centre of the metal bell is a projecting boss for deflecting the products of combustion.

BOUSFIELD, G. T. *Improvements in pumps.* (A communication.) Dated July 15, 1856. (No. 1667.)

Two buckets are used in the same or different barrels, in combination with two spiral cams, so arranged that each one lifts one of the buckets for more than half its revolution with a uniform ascending motion, the other bucket descending more rapidly by reaching the lower end of the stroke and beginning to ascend before the other bucket has reached its extreme height.

TURNER, H. *Improvements in cutting hides for making flexible pipes and for certain other purposes.* Dated July 16, 1856. (No. 1670.)

This consists in cutting hides into continuous lengths, as described in the specification of a patent granted to the patentee 8th Aug., 1854; and in the application of the said mode of cutting hides into straps or bands for making card fillets, used in machinery for preparing cotton, &c., for making harness, and for other purposes.

FORD, J., and P. KNOWLES. *Improvements in machinery for cleaning and preparing cotton and other fibrous substances.* Dated July 16, 1856. (No. 1671.)

This consists—1. In the application of machinery for batting or striking cotton, &c., to loosen or remove impurities. 2. In the application of a revolving roller covered with teeth or projections, and placed between two sets of feed rollers, to prepare the fibrous material for the beater of the blower or other such machine.

NEWTON, A. V. *Improved apparatus for obtaining rotary motion.* (A communication.) Dated July 16, 1856. (No. 1672.)

Claim—The method described of imparting rotary motion to a wheel or wheels, by the pressure of steam or other equivalent expanded gas, acting alternately on the opposite one of two columns of water or other liquid connected together, to cause the said water by such alternate action to pass through and impel the wheel or wheels.

MORGAN, R. *A pocket-case for containing address cards, stamps, and other similar articles.* Dated July 16, 1856. (No. 1673.)

The patentee forms a box or case with a hinged lid or top piece, somewhat like a jewel case, and fits it up for holding cards, stamps, a pencil, &c.

DUNCAN, T. *A combined and compound engine for applying motive power, and for measuring fluids.* Dated July 16, 1856. (No. 1674.)

The patentee describes a number of detailed improvements chiefly applicable to motive power engines worked by the pressure of water supplied to the cylinders of the engine by pipes, and suitable to measuring the flow of water fluids.

BOWLAS, D. *Improvements in "throstles" and doubling-frames for spinning and doubling cotton and other fibrous materials.* Dated July 16, 1856. (No. 1675.)

This relates to the spindle and flyer. The patentee employs a spindle, the lower end of which is stouter than the upper, and is supported in a step-piece in the copping or lifting rail. The upper part is provided with a "braid" or plate, upon which the bobbin is placed, and with which it runs, as required, by the rotation of the bobbin upon the spindle and its disc. The flyer is inverted, having its arms extending upwards, and is mounted at the upper end of a tube surrounding and supporting the spindle, and of about one-third its length, and is driven by a "whirl" or pulley fixed upon it, and revolves in boulster or guide rails above and below the driving wheel. The lower end of the spindle has a drag band round it, to equalize the drag.

CAMERON, D. *Improvements in cranes or lifting and lowering-apparatus.* Dated July 16, 1856. (No. 1676.)

This relates to cranes of the moveable jib or derrick class, and is intended to prevent accidents from the failure of the parts connected with the jib suspension.

JOHNSON, J. H. *Improvements in circular looms.* (A communication.) Dated July 16, 1856. (No. 1677.)

This invention relates to a mode of working the sinkers of circular looms, which cannot be described without illustrations.

GURLT, A. F. *Improvements in the manufacture of iron and steel.* Dated July 16, 1856. (No. 1679.)

This applies to the reduction, carbonization, and smelting of ores of iron, which, when treated as described, give malleable iron, steel, or cast-iron, by means of furnaces of peculiar construction, which allow of the application of ignited gas, or a mixture of gas and flame to the ores.

BARLOW, C. *An improved surveying instrument.* (A communication.) Dated July 17, 1856. (No. 1680.)

This invention, called a "Clitometer," consists of an instrument for measuring lines or surfaces, and may be used in lieu of a water or air level, and the level and plumb line. It requires engravings to illustrate it.

BRAGG, H., jun. *Improvements in drying air, and in machinery for stretching, drying, and finishing fabrics.* Dated July 17, 1856. (No. 1681.)

1. Air is dried by causing it to pass through tubes or chambers surrounded by cold water, or cooled by other means, to condense its moisture. 2. An improved compound stenter frame is used for stretching, drying, and finishing two or more pieces of fabric simultaneously, parts of which are applicable to stenter frames of the usual construction.

CARTWRIGHT, J. *Improvements in agricultural implements, called chain harrows, for more effectually dressing and cleaning land.* Dated July 17, 1856. (No. 1683.)

Chain harrows are made with the links gradually decreasing in weight, the heavy links being in the first section.

JACQUE, G. *Improvements in the construction of stringed musical instruments.* Dated July 17, 1856. (No. 1684.)

The patentee employs in the interior of violins, &c., a supplementary set of strings, to be sounded by sympathy with the ordinary strings.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

NOONE, J. H. *Improvements in apparatus for retarding and stopping carriages on railways.* Dated July 7, 1856. (No. 1599.)

A combination of apparatus is used for lowering skids or friction surfaces on to the rails, and lifting the wheels of the carriages off.

GRAY, A., and J. RAWSON. *Improvements in means or apparatus for lubricating.* Dated July 8, 1856. (No. 1611.)

Parts are arranged in connection with a perforated spindle leading from the vessel containing the lubricating matter to the part to be lubricated.

BAYER, L. *An improved stuffing to be used in place of hair or other substances in which such articles are commonly employed.* Dated July 8, 1856. (No. 1612.)

Vegetable fibre obtained from the colonial plantain-tree, or musa paradisiaca, is taken from the tree and submitted to the ordinary processes of dyeing, curling, carding, &c.

PIGOTT, H. *Improvements in hats and other coverings for the head.* Dated July 8, 1856. (No. 1614.)

The lining is attached in the usual way to the hat near the brim thereof for the greater part of the way round, but behind the portion embracing the temples and forehead a thin space is left to admit air, and to allow of adjustment to the shape of the head at that part. Two plies of material are interposed between the lining and the hat body at that part.

KRUPP, A. *Improvements in the permanent way of railways.* Dated July 9, 1856. (No. 1617.)

The rails of railways are to be formed of two distinct and separate parts, of different metals. The lower portion is of cast or wrought iron, and has its upper surface formed with a groove, or with a portion cut away upon the sides, so as to receive the upper piece, which are made of steel.

DARLINGTON, G. and J. *Improvements in the manufacture or production of zinc or spelter.* Dated July 9, 1856. (No. 1619.)

The inventors take the ores of zinc, pound them, and admix them, as may be found necessary, with lime, limestone, tapcinder, or any product yielding siliceous matter, or suitable carbonaceous matter. The ores, &c., either in a reverberatory furnace, or mixed with the fuel of a blast furnace, are then exposed to heat to effect the re-actions necessary to the production of the oxide of zinc. This oxide of zinc is next passed through a fire, enclosed in a furnace or in tubes, and the metallic zinc is obtained.

HAYDEN, D. W. *Improvements in fastenings for window shutters.* Dated July 9, 1856. (No. 1621.)

This invention provides for the obtainment of complete security by means of details, which are always retained in their place, and can never be mislaid or lost, the acts of fastening and unfastening being almost automatic.

WILSON, E. *Improvements in pistons for steam engines driven by steam or any other elastic fluid, which improvements are also applicable to the pistons or plungers of pumps.* Dated July 9, 1856. (No. 1625.)

One metallic packing ring only is applied, which is cut in one place. This packing ring is placed in a recess in the piston head or plunger, and is forced against the internal surface of the cylinder, and rendered steam tight by its own elasticity, obtained by slightly hammering its internal surface previous to it being turned and cut, or by placing a light metallic spring against its internal surface.

ADCOCK, H. *An improvement in casting iron and other metal.* Dated July 9, 1856. (No. 1629.)

Sand moulds are placed in an oven (or muffle) at some inches above the bottom of it, so that the drying may be affected by the moulds being heated on all sides and at the bottom by the heated air in the oven. After the moisture is dispersed from them, the fire is increased until the moulds are brought to a very high degree of heat; the metal is then run into the moulds, and then the oven, with the moulds and castings therein, is allowed to cool down.

RUSSELL, F. W. *Improvements in the mode of coupling railway carriages.* Dated July 10, 1856. (No. 1630.)

Railway carriages are to be coupled without the passing of an attendant between them. Several arrangements of parts are proposed for the purpose.

DENDY, R. *Improvements in horse rakes.* Dated July 14, 1856. (No. 1655.)

Horse-rakes are constructed with tubular frames, and with a seat for the driver mounted on saddles or curved pieces which connect the back and front bars of the frame together, and likewise connect the shafts with the frame; also improved arrangements are used for lifting the teeth or tines.

EDWARDS, W. *An improvement or improvements in lathes, applicable also in part or on the whole to tools for boring, shaping, cutting, and screwing metals.* Dated July 15, 1856. (No. 1659.)

This invention comprises a variation in the construction of the driving headstock of double geared lathes, which is applicable also to machines for boring, shaping, cutting, and screwing metals, and a variation in the construction of the self-acting bracket used to support the long traversing shaft or regulating screw of slide lathes.

LEIGH, E. *Improvements in the mode or method of generating steam and applying it for the purpose of obtaining motive power.* (Partly a communication.) Dated July 15, 1856. (No. 1662.)

To recover a portion of the waste heat in its passage to the chimney, and return it to the fires, pipes are inserted in the flue beyond the boilers. The pipes are open to the atmosphere at one end, the other end terminating in the ash-pit, which is closed. The effect is, the fire is fed with heated air. Also, in using low-pressure engines an auxiliary high-pressure engine is employed,

the exhaust steam from which heats the whole of the feed water for both of them.

Knowelden, J. *Improvements in apparatus for preventing steam boiler explosions.* Dated July 15, 1856. (No. 1663.)

The inventor arranges two valves in such manner that one becomes the fulcrum of the lever of the other, and so arranges a float and a spherical valve that, on the water in the boiler falling too low, part of it escapes and puts out the fire. The same effect is produced by an excess of internal pressure.

Blyth, C. B., and W. P. Butchart. *Improvements in weaving.* Dated July 15, 1856. (No. 1666.)

In order to give increased time for the passage of the shuttle, the slay or lathe is to be actuated by a differential movement, obtained by any suitable mechanical contrivance.

Schmidt, W. and E. *An improved balance for weighing.* Dated July 16, 1856. (No. 1668.)

The axle of the beam is made with a projecting shoulder at one side of the front part of the knife edges, and with a similar projecting part upon the opposite side at the back part of the knife edges, which form the points on which the beam turns. These shoulders enter recesses in the supports upon which the knife edges rest, and serve to preserve the equilibrium of the scale pans when either side is loaded.

Bourne, J. *An improved construction of paddle-wheels, usually termed feathering paddle-wheels.* (A communication.) Dated July 16, 1856. (No. 1669.)

In feathering paddle-wheels, the floats are so formed as to turn on a central horizontal spindle, their movements being governed by arms proceeding from two eccentrics placed one on the side of the ship, and one on the paddle-box at the end of the shaft. Each float has an arm at each end to work it, and each set of arms is combined into a wheel by suitable segments.

Eskholme, G., and H. Wilkes. *Improvements in ball cocks and cocks in general for drawing off fluids.* Dated July 16, 1856. (No. 1678.)

In this invention, the opening and closing valve is made to act in conjunction with the pressure of the fluid when in the act of closing the cock.

Andrew, F., and S. Forsell. *Certain improvements in machinery or apparatus for sizing, stiffening, dressing, and polishing yarns or threads.* Dated July 17, 1856. (No. 1682.)

The inventors impart a to and fro or elliptical motion to the brush by cranks or otherwise, so that, when the brush is applied, the bristles enter gradually between the yarns or threads, and, after having been drawn through or along them, is drawn out, so that the return stroke may be made without acting on them.

PROVISIONAL PROTECTIONS.

Dated February 19, 1857.

483. George Frederick Lee Meakin, Albion-street, Hyde-park, surveyor and civil engineer. An improved method of applying breaks to railway carriages.

Dated February 23, 1857.

520. Edward Robert Wood, of Stonthall, Swansea, Glamorganshire, gentleman. Improvements in labels.

522. Charles Alexis Bourdier and Victor Masselon, both of Trafalgar-square, Charing-cross. Improvements in obtaining and applying motive power.

524. James Brown, of Aldgate, London, chemist. A method or methods of preparing paper to enable it to receive an impression from an engraved block or plate, type, or other printing agent, while in a dry state.

526. Giuseppe Devincenzi, of Maddox-street, Middlesex, gentleman. Improvements in producing figures and designs upon plates for printing from.

530. Charles Henry Murray, of Oakley-cottages, Old Kent-road, machinist. An improved construction of chain pump.

532. Aimé Koch, of Belfast. Improvements in machinery for breaking and scutching flax, hemp, and other fibrous substances.

534. George Barnett, of Aldersgate-street, London. Improvements in fasteners for parts of garments.

Dated February 24, 1857.

536. Claude François Latruffe, of Rue de l'Echiquier, Paris. Improvements in heating apparatus.

538. Stephen Wright Hawks, of Gateshead-upon-Tyne, engineer. Improvements in railway chairs.

540. Joseph Robinson, of Glasgow-terrace, Thames-bank, Pimlico, Middlesex. Improvements in the stages used in green houses and hot-houses.

542. John Pullar and Laurence Pullar, of Perth, manufacturers. An improvement in the manufacture of umbrellas and parasols.

544. George McCallan, of Johnstone, Renfrew, gas fitter. Improvements in air and water discharge apparatus for steam pipes.

546. James Thornton, of Belfast, civil engineer. Improvements in the manufacture of bricks, tiles, and tubes of earthenware.

Dated February 25, 1857.

548. William Wood, of Monkhill-house, near Pontefract, York, gentleman. Improvements in machinery or apparatus used in the manufacture of carpets and other pile fabrics.

550. Job Mead and George Mead, of Bethnal-green, iron-plate workers. Improvements in metallic packing boxes or cases.

552. William Edward Newton, of Chancery-lane, civil engineer. Improved machinery for making preparings from waste silk, cotton, wool, flax, hemp, and other fibrous materials. A communication from M. A. L. Warnery, of Lyons.

554. Christian Schwedersky, of Railway-place, Fenchurch-street, London, merchant. Improvements in floating ships or vessels.

Dated February 26, 1857.

561. Thomas George Shaw, of Great St. Helens, Bishopsgate, London, merchant. An improved thrashing and winnowing machine, which he calls flail thrashing machine for corn and other grain.

563. David Owen Edwards, surgeon, of Cambridge-villa, Gilston-road, West Brompton, Middlesex. Ventilating and removing the products of combustion of fuel and of respiration from the apartments of dwelling houses and from public buildings.

565. Andrew Peddie How, of Mark-lane, London, engineer. Improvements in machinery or tools for drilling and boring.

567. Joseph Slatterie Edwards, Blackfriars-road, flour and corn merchants. The preparation and novel application of a certain foreign fruit, or vegetable as an article of food, confectionary, or to be used in brewing or distilling, or for the manufacture of sugar and gum.

569. Brook Hodgson and John Carter, of Halifax, York. Improvements in looms for weaving Brussels carpets and other terry fabrics.

571. Walter Macfarlane, of Glasgow, engineer. Improvements in moulding or manufacturing cast iron pipes.

Dated February 27, 1857.

573. Godfrey Ermen and Francis Spencer, both of Manchester, manufacturers. Improvements in the manufacture of bands, straps, or belts for driving machinery, and for other purposes.

575. William Robertson and James Guthrie Orchar, of Dundee, engineers, and John Menzies, of Ordie Mill, Perth, shuttle maker. Improvements in machinery or apparatus for winding yarns or thread.

577. Edward Mucklow, of Bury, Lancaster, manufacturing chemist. Certain improvements in apparatus to be employed for the purposes of cooling and evaporating.

581. Samuel Draper, of Lenton, Nottingham. Improvements in apparatus for retarding and stopping carriages on railways, and in cocks or taps used for such and other purposes.

583. William Edward Newton, of Chancery-lane, civil engineer. Improved valve gear for reciprocating steam engines whose power is applied directly by the piston without employing a rotary shaft. A communication.

Dated February 28, 1857.

585. Edgar Heale and Mary Ann Heale, of Albion-terrace, Hatfield New-town, Hertfordshire. The treatment of vegetable and other substances.

587. Jessee Briggs, of Newsted-mill, Pudsey, near Leeds. Improvements in looms for weaving.

589. Thomas Horton, of Birmingham, manufacturer. An improvement or improvements in the manufacture of mottled or variegated soaps.

591. James Edward M'Connell, of Wolverton, Buckingham, civil engineer. Improvements in railway breaks.

593. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris. Improvements in window shutters. A communication.

595. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improvement in the manufacture of sulphate of soda. A communication from L. Mesdach, of Paris.

597. Theodore Hyla Jennens, of Hunter's-lane, Birmingham, gentleman. A new or improved manufacture of rollers or cylinders for printing fabrics.

Dated March 2, 1857.

599. Samuel Wright, of Halstead, Essex, brass-founder. Improvements in gas regulators.

601. Thomas Parker, of Sitwell-street, Derby, engineer. Improvements in railway wheels.

603. William Pedder, of Savage - gardens, Tower-hill, London, master mariner. Certain improved methods of strengthening metallic and other structures.

605. William Henry Smith, M.D., of Philadelphia, U. S. A., now of London, James Cadman, of Maestig, Glamorganshire, and Joseph Cadman, of Saundersfoot, Pembrokeshire. An improved method of manufacturing solid and hollow bricks, pipes, and other hollow and solid ware, from clay, shale, and other mineral substances.

607. Frederick William Mowbray, of Bradford, York, engineer. Improvements in weaving.

609. Charles Pauvert, of Chatellerault, French Empire, ecclesiastic. Certain improvements in manufacturing cast steel.

611. William Poupard, of Wych-street, Middlesex, engineer. An improvement in buttons and means of fastening buttons to garments and fabrics.

613. David Patridge, of Woolwich, Kent, engineer. Improvements in steam boilers.

615. James Anderson, of West Bromwich, Stafford, manager. An improvement in the process generally termed "gathering," used in the manufacture of certain kinds of glass.

Dated March 3, 1857.

619. John Banks, of Northampton. A new description of life preserver adapted also to the preservation of property.

621. George Danré, engineer, and Pierre Fortuné Victor Mouillard, gentleman, and Pierre Adrien Mercier, gentleman, of Paris. An improved method of, and apparatus for, heating by gas.

623. Thomas Ball, of Nottingham. An improvement in the manufacture of warp fabrics suitable for the manufacture of gloves.

625. William Edward Newton, of Chancery-lane, civil engineer. Improved machinery for removing snow from railways. A communication.

627. William Taylor, of How-wood, Renfrew, merchant. Improvements in the manufacture of iron and steel.

629. Robert Mair, of Edinburgh, gentleman. Improvements in apparatus for protecting articles worn on the person.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

647. Thomas Burstall, of Southall, Middlesex, civil engineer. Certain improved machinery for manufacturing bricks and tiles from clay alone or mixed with other materials. Dated March 5, 1857.

674. George Philcox, of Stebon-terrace, Stepney, Middlesex, chronometer maker. Improvements in marine and pocket chronometers and other time keepers. Dated March 9, 1857.

696. Nathan Appleton Dyar, of Massachusetts, U. S. A. A new and useful composition to be applied as a covering to the sides and roofs of buildings, and for various other purposes. Dated March 9, 1857.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," March* 17*th*, 1857.)

2583. J. Jessop. Improvements in machinery for washing, wringing, and mangling.

2592. A. J. I. de Montenay du Minhy. Improvements in screw hand-presses. A communication.

2610. G. H. Stevens and R. Fitch. Improvements in locking and unlocking jars, bottles, and other vessels, and making such vessels air-tight.

2611. J. La Cabra. Improvements in the action of pianofortes.

2618. F. Chapman and C. Bowyer. A method of purifying and disinfecting intestines, and manufacturing gelatine therefrom.

2621. T. Ollis, jun. Improvements in machinery or apparatus for cutting paper, card-board, mill-board, scale-board, leather, and other substances of a like nature.

2624. A. Holt and J. Bentley. Improvements in machinery for weaving stuff and other goods.

2637. R. A. Brooman. Improvements in preserving provisions. A communication.

2644. P. Gaskell. The admission of steam into the cylinders of steam engines by an equilibrium valve.

2648. W. Smith. Improvements in machinery for sewing cloth and other materials.

2649. J. P. Jones. Improvements in the manufacture of rollers or cylinders for printing fabrics, and in machinery to be used in manufacturing the said rollers or cylinders.

2662. J. Eccles. Improvements in machinery for making bricks, tiles, pipes, and other articles made of plastic materials.

2666. J. Apperly and W. Clissold. Improved apparatus for condensing wool, cotton, and other fibrous substances.

2681. The Hon. W. E. Cochrane. Improvements in the permanent way of railways.

2683. J. Hacking. Certain improvements in machinery for dressing, polishing, and finishing threads and yarns.

2684. T. B. Sharp and J. A. Collet. Certain improvements in locomotive steam engines.

2686. R. Emery. Improvements in springs for carriages and other vehicles.

2687. R. Emery. Improvements in the construction of axles and boxes of carriages for common roads.

2696. A. Reid and C. O'Neil. Improvements in treating metallic ores to obtain copper.

2698. J. Greaves. An improved construction of ladies' side saddle. A communication.

2706. G. Davies. An improved paper, suitable for the filtration of liquids, the dressing of wounds, and for the manufacture of envelopes, bags, bands, and for other similar purposes. A communication.

2717. E. Blanchon. Machinery and apparatus for marking and boring leather and other similar substances, for making and cutting screwed pins, and for uniting leather and other similar materials. A communication.

2738. A. Watson and A. H. Williams. An improved cap or top for scent-bottles.

2739. S. Fox. Improvements in machinery for drawing wire and tubes.

2741. S. Fox. Improvements in heating steel wire and tubes, also ribs and stretchers of umbrellas and parasols for hardening, and in apparatus for straightening wire and tubes.

2763. J. Barrans. Improvements in apparatus for applying oil or lubricating fluid to the axles of railway carriages and locomotive engines.

2767. T. Roberts, J. Dale, and J. D. Pritchard. Improvements in obtaining and purifying oxalate of soda, which improvements are also applicable to the manufacture of oxalic acid.

2805. A. V. Newton. An improvement in the process of coating iron bolts, bars, sheets, spikes, nails, and other articles of iron, with metallic alloys, for the prevention of rusting or oxidation. A communication.

2808. P. A. Lecomte de Fontainemoreau. Improved weighing-apparatus. A communication.

2857. R. Dryden. An improvement in the construction of cylinder printing-presses.

2894. W. H. Bowers. Improvements in apparatus to be used for the purposes of distillation.

2911. E. Burwell. An improvement in roasters for coffee, cocoa, chicory, and similar substances.

2914. J. Browning. Improvements in stereoscopes.

2930. J. Cornes. Improvements in chaff-cutting machines.

2935. M. Burke. Improvements in the construction of anchors.

2994. V. L. C. Renou. An improvement in the manufacture of spirit when rice is used.

340. R. A. Brooman. Improvements in preparing or dressing threads and other fibrous materials, and in the machinery employed therein. A communication.

369. C. Turner. Improvements in or applicable to the class of hats made from straw, grass, palm-leaf, or other like materials.

392. A. Royds and J. Kenyon. Certain improvements, or a certain improvement, in machines for spinning or doubling, commonly known as throstles.

411. D. Baker. Improvements in the manufacture of compounds of alumina and of magnesia.

484. D. L. Price. Improvements in electric apparatus for giving signals, and appliances connected therewith,

487. J. Crook. Improvements in looms for weaving elastic and other fabrics.

509. F. H. Thomson. Improvements in the manufacture of iron.

512. J. Middleton and W. Stent. Improvements in railway chairs, and in the jointing of rails for railways.

544. G. McCallan. Improvements in air and water discharge apparatus for steam pipes.

546. J. Thornton. Improvements in the manufacture of bricks, tiles, and tubes of earthenware.

548. W. Wood. Improvements in machinery or apparatus used in the manufacture of carpets and other pile fabrics.

553. L. E. O. Degrand. Certain improved lenticular glasses for lighting and reflecting, or refracting.

559. A. Godet. Improvements in reefing sails.

591. J. E. M'Connell. Improvements in railway breaks.

609. C. Pauvert. Certain improvements in manufacturing cast steel.

613. D. Patridge. Improvements in steam boilers.

629. R. Mair. Improvements in apparatus for protecting articles worn on the person.

647. T. Burstall. Certain improved machinery for manufacturing bricks and tiles from clay alone or mixed with other materials.

696. N. A. Dyar. A new and useful composition to be applied as a covering to the sides and roofs of buildings, and for various other purposes.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1854.

576. Peter Armand Lecomte de Fontainemoreau.
598. Lawrence Whitaker, John Diggle, and George Howarth.
603. Edward Haeffely.
629. Robert Weare.
637. Rice Williams Harris and T. Patstone.
641. George Harman Barth.
684. Frederick Seiler.
910. Henry Brown.

LIST OF SEALED PATENTS.

Sealed March 13, 1857.

2149. Christopher Hill.
2155. Cornelius Ferguson Clements.
2171. Joseph Gilbert Martien.

2203. Edward Finch.
2655. Hugh Baines.
2671. William Green, jun., and T. Storey.
2984. Alfred Vincent Newton.
130. Matthew Andrew Muir and J. M'Ilwham.

Sealed March 17, 1857.

2172. Robert Burns.
2174. David Crichton.
2175. John Barber.
2178. Alfred Lodwick Newman.
2182. John Muir Hetherington and J. Gee.
2190. William Frederick Plummer.
2193. Charles Goodyear, jun.
2194. Jean Baptiste Honoré de Roussen.
2196. Charles Fréderic Vasserot.
2198. Pierre Laffitte.
2213. Thomas Webster Rammell.
2215. Alfred Ford.
2216. George William Sayer.
2239. William Beatson.
2244. Joseph William Wilson.
2320. Charles Durand Gardissal.
2381. Robert McConnell and A. Mackenzie.
2563. Edward Joseph Hughes.
2983. William Edward Newton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris: Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

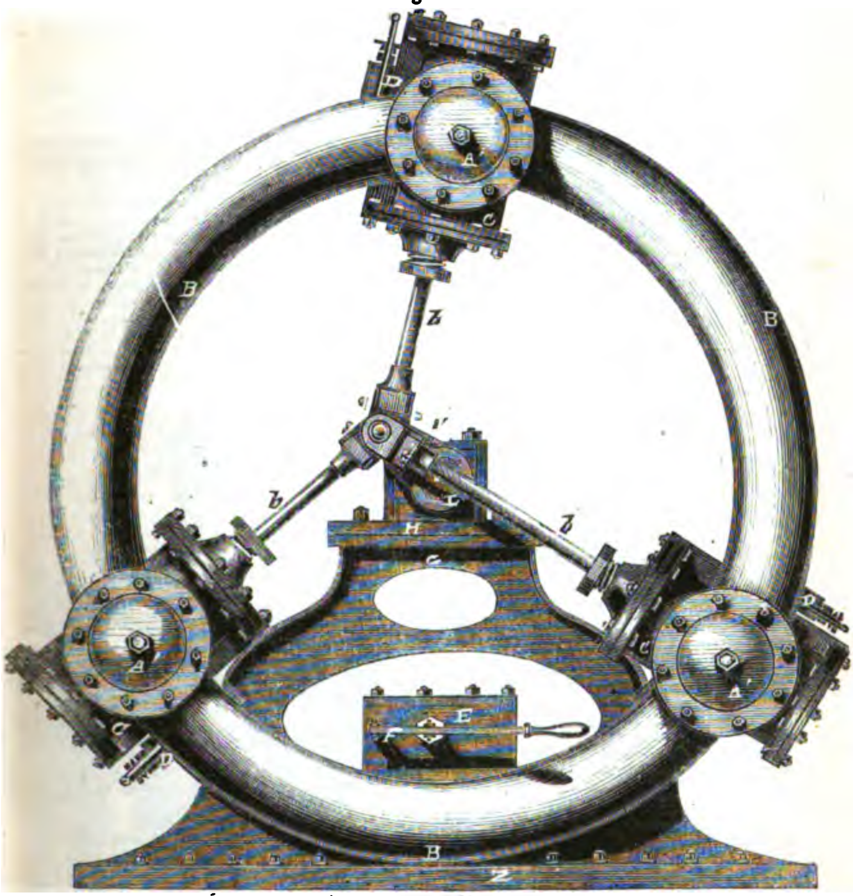
Mechanics' Magazine.

No. 1755.] SATURDAY, MARCH 28, 1857. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

HALL, WYLDE, AND WAITE'S IMPROVED STEAM ENGINES.

Fig. 1.



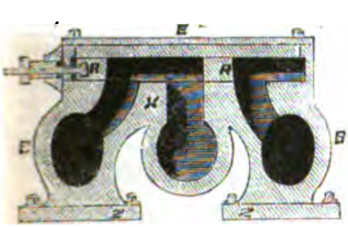


Fig. 3.

Fig. 4.

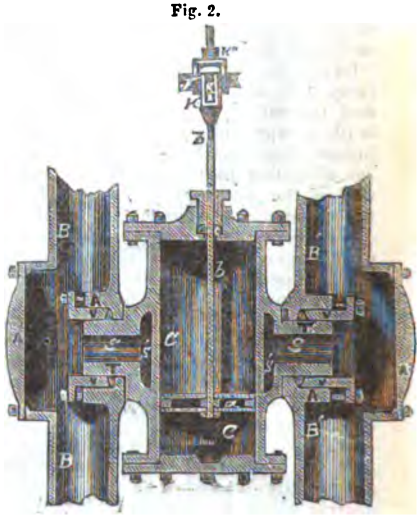
Fig. 5.

HALL, WYLDE, AND WAITE'S IMPROVED STEAM ENGINES.

Messrs. Hall, Wylde, and Waite, of Birmingham, have patented a novel arrangement of engines, in which three oscillating cylinders are mounted upon a ring at equal distances, and have their pistons connected through suitable rods to one common crank; and also a new valve for, and method of supplying steam to, such cylinders, whereby, on simply shifting the valves, the engines are reversed; the valve on being moved changes the exhaust passage to the feed, and the feed to the exhaust.

Fig. 1 of the accompanying engravings is a side elevation of a steam engine constructed according to their invention; fig. 2 is a section through one of the cylinders, trunnions, and steam pipes; fig. 3 is a section through the regulator chest; fig. 4 is a side elevation, partly in section, of one of the cylinders detached; and fig. 5 is a sectional elevation of the regulator valve. B, B′ are two hollow rings of wrought iron, having the foot, Z, bolted to a base plate. These rings, B, B′, form the frame and supports for the cylinders, and the interior of the rings forms the passages by which the steam is conveyed to or from the chest to the cylinders. C, C, C are the cylinders, cast in a piece with their trunnions, T, and placed at equal distances apart between the rings, B, B′. The trunnions, T, are fitted in bearings formed in the rings, B, B′, and are free to oscillate thereon. V V are glands screwed to the packing boxes to make the trunnions steam tight; A, A, A are the trunnion boxes, of wrought iron, or of iron cast with the rings, B, B′. Each box has a lid or cover, A′, screwed to it, which can be removed when the trunnions are to be packed. Corresponding trunnion boxes and covers are placed on the opposite side of the rings. *a* is the piston fixed on its rod, *b*, and working through the stuffing box, *c*. There is, of course, a piston, *a*, rod, *b*, and stuffing box, *c*, for each cylinder. G is a strong bracket or framing for carrying the crank shaft, I, which works on bearings fitted in a plummer block, H, and bolted to the bracket, G; I′ is the crank: and J the crank pin or stud; K, K′, K″ are caps for connecting the three piston rods, *b*, *b*, *b*, to one crank, I′. These caps are connected to and work on the pin, J; the second cap, K′, is forked, and spans the sides of the centre cap, K; the third, K″, is also forked, and spans both the second and centre cap, the pin, J, being common to the three. The arrangement will be clearly seen in fig. 2. D is a valve casing, of which there is one fitted to each cylinder; L is the valve on its seat; this valve is wedge-shaped, and is worked by a valve spindle or rod, to which a cross head is attached, and connected by means of links free to vibrate on fixed studs to the rings, B, B′: the position of the ports in relation to the valve is altered by the oscillation of the cylinders. S, S are the steam ways or passages. S′ is a belt surrounding the cylinders, and through which the steam circulates. E is the regulator chest, the facing of which is perfectly flat; R, R, R is the regulator valve in the chest, E, by which the engine is stopped and reversed; this valve is wedge-shaped, similar to the valve before described, and is worked by a lever and rod connected to the handle, F. *d d* are wedges or V-pieces fixed by the screws, *e e*, against the valve, to keep it firm on its face, and to prevent the steam from entering the engine without first passing by the valve. There are two grooves on the sides of the valve for the wedges, *d*, to work in, which keep the valve in place, and prevent it sticking. The regulator is so constructed that the induction and eduction of the steam may be reversed when desired, making the induction pipe the eduction, and *vice versâ*. The regulator also affects all the cylinders alike, and at the same time, and it is placed for convenience at the lower part of the rings, B, B′. X is the exhaust; on the opposite side is the steam pipe. The steam and exhaust pipes are jointed to the regulator box between the rings, B, B′. The steam in the regulator chest is always on the outside of the valve, but in the cylinder steam chest the steam is out or inside the valve, as the engine is required to run, thus making the outside of the valve the exhaust when going one way, and the inside the exhaust when going the other. Now, supposing steam to be admitted from the regulator chest by the pipe, B, it will first pass through the trunnion, T, then surround the belt, S′, and enter the casing, D, whence it is admitted by the valve, L, into the passages, S, to the top or bottom of the cylinder, as the case may be; after the piston has made its stroke, the steam returns by the passages S on the other side of the cylinder, where it is conducted by the ring, B′, through the regulator chest, E, and thence to the condenser or otherwise, or the reverse operation will take place by making the ring, B′, the passage for the admission of steam, and B the exhaust. The whole can be regulated at pleasure by moving the lever, F, in the regulator chest.

Fig. 2.



ON THE CONSERVATION OF FORCE.

By Professor Faraday, D.C.L., F.R.S.*

Various circumstances induce me at the present moment to put forth a consideration regarding the conservation of force. I do not suppose that I can utter any truth respecting it that has not already presented itself to the high and piercing intellects which move within the exalted regions of science; but the course of my own investigations and views makes me think, that the consideration may be of service to those persevering labourers (amongst whom I endeavour to class myself,) who, occupied in the comparison of physical ideas with fundamental principles, and continually sustaining and aiding themselves by experiment and observation, delight to labour for the advance of natural knowledge, and strive to follow it into undiscovered regions.

There is no question which lies closer to the root of all physical knowledge, than that which inquires whether force can be destroyed or not. The progress of the strict science of modern times has tended more and more to produce the conviction that "force can neither be created nor destroyed;" and to render daily more manifest the value of the knowledge of that truth in experimental research. To admit, indeed, that force may be destructible or can altogether disappear, would be to admit that matter could be uncreated; for we know matter only by its forces: and though one of these is most commonly referred to, namely, gravity, to prove its presence, it is not because gravity has any pretension, or any exemption, amongst the forms of force as regards the principle of *conservation;* but simply that being, as far as we perceive, inconvertible in its nature and unchangeable in its manifestation, it offers an unchanging test of the matter which we recognize by it.

Agreeing with those who admit the conservation of force to be a principle in physics as large and sure as that of the indestructibility of matter, or the invariability of gravity, I think that no particular idea of force has a right to unlimited or unqualified acceptance, that does not include *assent* to it; and also, to *definite amount* and *definite disposition of the force*, either in one effect or another, for these are necessary consequences: therefore, I urge, that the conservation of force ought to be admitted as a physical principle in all our hypotheses, whether partial or general, regarding the actions of matter. I have had doubts in my own mind whether the considerations I am about to advance are not rather metaphysical than physical. I am unable to define what is metaphysical in physical science; and am exceedingly adverse to the easy and unconsidered admission of one supposition upon another, suggested as they often are by very imperfect induction from a small number of facts, or by a very imperfect observation of the facts themselves: but, on the other hand, I think the philosopher may be bold in his application of principles which have been developed by close inquiry, have stood through much investigation, and continually increase in force. For instance, *time* is growing up daily into importance as an element in the exercise of force. The earth moves in its orbit in time; the crust of the earth moves in time; light moves in time; an electro-magnet requires time for its charge by an electric current: to inquire, therefore, whether power, acting either at sensible or insensible distances, always acts in *time*, is not to be metaphysical; if it acts in time and across space, it must act by physical lines of force; and our view of the nature of the force may be affected to the extremest degree by the conclusions, which experiment and observation on time may supply: being, perhaps, finally determinable only by them. To inquire after the possible time in which gravitating, magnetic, or electric force is exerted, is no more metaphysical than to mark the times of the hands of a clock in their progress; or that of the temple of Serapis in its ascents and descents; or the periods of the occultations of Jupiter's satellites; or that in which the light from them comes to the earth. Again, in some of the known cases of action in time, something happens whilst the *time* is passing which did not happen before, and does not continue after: it is, therefore, not metaphysical to expect an effect in *every* case, or to endeavour to discover its existence and determine its nature. So in regard to the principle of the conservation of force; I do not think that to admit it and its consequences, whatever they may be, is to be metaphysical: on the contrary, if that word have any application to physics, then I think that any hypothesis, whether of heat, or electricity, or gravitation, or any other form of force, which, either willingly or unwillingly, dispenses with the principle of conservation, is more liable to the charge, than those which, by including it, become so far more strict and precise.

Supposing that the truth of the principle

* The above is a report, prepared by Professor Faraday himself, of a lecture delivered by him at the Royal Institution, on Friday, February 27. The lecture has excited a considerable sensation among the philosophers, and is therefore given above in full. We shall probably offer a few remarks upon it shortly.

of the conservation of force is assented to, I come to *its uses*. No hypothesis should be admitted, nor any assertion of a fact credited, that denies the principle. No view should be inconsistent or incompatible with it. Many of our hypotheses in the present state of science may not comprehend it, and may be unable to suggest its consequences; but none should oppose or contradict it.

If the principle be admitted, we perceive at once, that a theory or definition, though it may not contradict the principle, cannot be accepted as sufficient or complete unless the former be contained in it; that however well or perfectly the definition may include and represent the state of things commonly considered under it, that state or result is only partial, and must not be accepted as exhausting the power or being the full equivalent, and therefore cannot be considered as representing its *whole nature;* that, indeed, it may express only a very small part of the whole, only a residual phenomenon, and hence give us but little indication of the full natural truth. Allowing the principle its force, we ought, in every hypothesis, either to account for its consequences by saying what the changes are when force of a given kind apparently disappears, as when ice thaws, or else should leave space for the idea of the conversion. If any hypothesis, more or less trustworthy on other accounts, is insufficient in expressing it or incompatible with it, the place of deficiency or opposition should be marked as the most important for examination; for there lies the hope of a discovery of new laws or a new condition of force. The deficiency should never be accepted as satisfactory, but be remembered and used as a stimulant to further inquiry; for conversions of force may here be hoped for. Suppositions may be accepted for the time, provided they are not in contradiction with the principle. Even an increased or diminished capacity is better than nothing at all; because such a supposition, if made, must be consistent with the nature of the original hypothesis, and may, therefore, by the application of experiment, be converted into a further test of probable truth. The case of a force simply removed or suspended, without a transferred exertion in some other direction, appears to me to be absolutely impossible.

If the principle be accepted as true, we have a right to pursue it to its consequences, no matter what they may be. It is, indeed, a duty to do so. A theory may be perfection, as far as it goes, but a consideration going beyond it, is not for that reason to be shut out. We might as well accept our limited horizon as the limits of the world. No magnitude, either of the phenomena or of the results to be dealt with, should stop our exertions to ascertain, by the use of the principle, that something remains to be discovered, and to trace in what direction that discovery may lie.

I will endeavour to illustrate some of the points which have been urged, by reference, in the first instance, to a case of power, which has long had great attractions for me, because of its extreme simplicity, its promising nature, its universal presence, and its invariability under like circumstances; on which, though I have experimented* and as yet failed, I think experiment would be well bestowed: I mean the force of gravitation. I believe I represent the received idea of the gravitating force aright, in saying, that it is *a simple attractive force exerted between any two or all the particles or masses of matter, at every sensible distance, but with a strength varying inversely as the square of the distance.* The usual idea of the force implies *direct* action at a distance; and such a view appears to present little difficulty except to Newton, and a few, including myself, who in that respect, may be of like mind with him.†

This idea of gravity appears to me to ignore entirely the principle of the conservation of force; and by the terms of its definition, if taken in an absolute sense, "*varying* inversely as the square of the distance" to be in direct opposition to it; and it becomes my duty, now, to point out where this contradiction occurs, and to use it in illustration of the principle of conservation. Assume two particles of matter A and B, in free space, and a force in each or in both by which they gravitate towards each other, the force being unalterable for an unchanging distance, but varying inversely as the square of the distance when the latter varies. Then, at the distance of 10 the force may be estimated as 1; whilst at the distance of 1, that is, one-tenth of the former, the force will be 100: and if we suppose an elastic spring to be introduced between the two as a measure of the attractive force, the power compressing it will be a hundred times as much in the latter case as in the former. But from whence can this enormous increase of the power come? If we say that it is the character of this force, and content ourselves with that as a sufficient answer, then it appears to me, we admit a *creation* of power, and that to an enormous amount; yet by a change of condition so small and simple as to fail in leading the least instructed mind to think that it can be a sufficient cause:—we should admit a result which would equal the highest act our minds can appreciate of the

* Philosophical Transactions, 1851, p. 1.

† See Note p. 294, col. 2.

working of infinite power upon matter; we should let loose the highest law in physical science which our faculties permit us to perceive, namely, the *conservation of force*. Suppose the two particles A and B removed back to the greater distance of 10, then the force of attraction would be only a hundredth part of that they previously possessed; this, according to the statement that the force varies inversely as the square of the distance would double the strangeness of the above results; it would be an *annihilation* of force; an effect equal in its infinity and its consequences with *creation*, and only within the power of Him who has created.

We have a right to view gravitation under every form that either its definition or its effects can suggest to the mind; it is our privilege to do so with every force in nature: and it is only by so doing that we have succeeded, to a large extent, in relating the various forms of power, so as to derive one from another, and thereby obtain confirmatory evidence of the great principle of the conservation of force. Then let us consider the two particles, A and B, as attracting each other by the force of gravitation, under another view. According to the definition, the force depends upon both particles; and if the particle, A or B, were by itself, it could not gravitate, that is, it could have no attraction, no *force* of gravity. Supposing A to exist in that isolated state, and without gravitating force, and then B placed in relation to it, gravitation comes on, as is supposed, on the part of both. Now, without trying to imagine *how* B, which had no gravitating force, can raise up gravitating force in A; and how A, equally without force beforehand, can raise up force in B, still, to imagine it as a fact done, is to admit a creation of force in both particles; and so to bring ourselves within the impossible consequences which have already been referred to.

It may be said, we cannot have an idea of one particle by itself, and so the reasoning fails. For my part, I can comprehend a particle by itself just as easily as many particles; and though I cannot conceive the relation of a lone particle to gravitation, according to the limited view which is at present taken of that force, I can conceive its relation to something which causes gravitation, and with which, whether the particle is alone, or one of a universe of other particles, it is always related. But the reasoning upon a lone particle does not fail; for as the particles can be separated, we can easily conceive of the particle B being removed to an infinite distance from A, and then the power in A will be infinitely diminished. Such removal of B will be as if it were annihilated in regard to A, and the force in A will be annihilated at the same time; so that the case of a lone particle and that where different distances only are considered become one, being identical with each other in their consequences. And as removal of B to an infinite distance is as regards A annihilation of B, so removal to the smallest degree is, in principle, the same thing with displacement through infinite space: the smallest increase in distance involves annihilation of power; the annihilation of the second particle, so as to have A alone, involves no other consequence in relation to gravity; there is difference in degree, but no difference in the character of the result.

It seems hardly necessary to observe, that the same line of thought grows up in the mind, if we consider the mutual gravitating action of one particle and many. The particle A will attract the particle B at the distance of a mile with a certain degree of force; it will attract a particle C at the same distance of a mile, with a power equal to that by which it attracts B; if myriads of like particles be placed at the given distance of a mile, A will attract each with equal force; and if other particles be accumulated round it, within and without the sphere of two miles diameter, it will attract them all with a force varying inversely with the square of the distance. How are we to conceive of this force growing up in A to a million fold or more? and if the surrounding particles be then removed, of its diminution in an equal degree? Or, how are we to look upon the power raised up in all these outer particles by the action of A on them, or by their action one on another, without admitting, according to the limited definition of gravitation, the facile generation and annihilation of force?

The assumption which we make for the time with regard to the nature of a power (as gravity, heat, &c.), and the form of words in which we express it, that is, its definition, should be consistent with the fundamental principles of force generally. The conservation of force is a fundamental principle; hence the assumption with regard to a particular form of force ought to imply what becomes of the force when its action is *increased* or *diminished*, or its *direction changed;* or else the assumption should admit that it is deficient on that point, being only half competent to represent the force; and, in any case, should not be opposed to the principle of conservation. The usual definition of gravity as *an attractive force between the particles of matter* VARYING *inversely as the square of the distance*, whilst it stands as a full definition of the power, is inconsistent with the principle of the conservation of force. If we accept the prin-

ciple, such a definition must be an imperfect account of the whole of the force, and is probably only a description of one exercise of that power, whatever the nature of the force itself may be. If the definition be accepted as tacitly including the conservation of force, then it ought to admit that consequences must occur during the suspended or diminished degree of its power as gravitation, equal in importance to the power suspended or hidden; being, in fact, equivalent to that diminution. It ought also to admit, that it is incompetent to suggest or deal with any of the consequences of that changed part or condition of the force, and cannot tell whether they depend on, or are related to, conditions *external* or *internal* to the gravitating particle; and, as it appears to me, can say neither yes nor no to any of the arguments or probabilities belonging to the subject.

If the definition *denies* the occurrence of such contingent results, it seems to me to be unphilosophical; if it simply *ignores* them, I think it is imperfect and insufficient; if it *admits* these things, or any part of them, then it prepares the natural philosopher to look for effects and conditions as yet unknown, and is open to any degree of development of the consequences and relations of power. By denying, it opposes a dogmatic barrier to improvement; by ignoring, it becomes in many respects an inert thing, often much in the way; by admitting, it rises to the dignity of a stimulus to investigation, a pilot to human science.

The principle of the conservation of force would lead us to assume, that when A and B attract each other less because of increasing distance, then some other exertion of power, either within or without them, is proportionately growing up; and again, that when their distance is diminished, as from 10 to 1, the power of attraction, now increased a hundred-fold, has been produced out of some other form of power which has been equivalently reduced. This enlarged assumption of the nature of gravity is not more metaphysical than the half assumption; and is, I believe, more philosophical, and more in accordance with all physical considerations. The half assumption is, in my view of the matter, more dogmatic and irrational than the whole, because it leaves it to be understood that power can be created and destroyed almost at pleasure.

When the equivalents of the various forms of force, as far as they are known, are considered, their differences appear very great; thus, a grain of water is known to have electric relations equivalent to a very powerful flash of lightning. It may, therefore, be supposed that a very large apparent amount of the force causing the phenomena of gravitation, may be the equivalent of a very small change in some unknown condition of the bodies, whose attraction is varying by change of distance. For my own part, many considerations urge my mind toward the idea of a cause of gravity which is not resident in the particles of matter merely, but constantly in them, and all space. I have already put forth considerations regarding gravity which partake of this idea,* and it seems to have been unhesitatingly accepted by Newton.†

There is one wonderful condition of matter, perhaps its only true indication, namely *inertia;* but in relation to the ordinary definition of gravity, it only adds to the difficulty. For if we consider two particles of matter at a certain distance apart, attracting each other under the power of gravity, and free to approach, they will approach; and when at only half the distance, each will have had stored up in it, because of its *inertia*, a certain amount of mechanical force. This must be due to the force exerted, and, if the conservation principle be true, must have consumed an equivalent proportion of the cause of attraction; and yet, according to the definition of gravity, the attractive force is not diminished thereby, but increased four-fold, the force growing up within itself the more rapidly the more it is occupied in producing other force. On the other hand, if mechanical force from without be used to separate the particles to twice their distance, this force is not stored up in momentum or by inertia, but disappears; and three-fourths of the attractive force at the first distance disappears with it. How can this be?

We know not the physical condition or action from which inertia results: but inertia is always a pure case of the conservation of force. It has a strict relation to gravity, as appears by the proportionate amount of force which gravity can communicate to the inert body; but it appears to have the same strict relation to other forces acting at a distance, as those of magnetism or electricity, when they are so applied by the tangential balance as to act independent of the gravitating force. It has the like strict relation

* Proceedings of the Royal Institution, 1855, vol. ii., p. 10, &c.

† "That gravity should be innate, inherent, and essential to matter, so that one body may act upon another, at a distance, through a *vacuum*, without the mediation of any thing else, by and through which their action and force may be conveyed from one to another, is to me so great an absurdity that I believe no man who has in philosophical matters a competent faculty of thinking, can ever fall into it. Gravity must be caused by an agent, acting constantly according to certain laws; but whether this agent be material or immaterial I have left to the consideration of my readers."—*See Newton's Third Letter to Bentley.*

to force communicated by impact, pull, or in any other way. It enables a body to take up and conserve a given amount of force until that force is transferred to other bodies, or changed into an equivalent of some other form; that is all that we perceive in it: and we cannot find a more striking instance amongst natural or possible phenomena of the necessity of the conservation of force as a law of nature, or one more in contrast with the assumed variable condition of the gravitating force supposed to reside in the particles of matter.

Even gravity itself furnishes the strictest proof of the conservation of force in this, that its power is unchangeable for the same distance; and is by that in striking contrast with the variation which we assume in regard to the *cause of gravity*, to account for the *results* at different distances.

(To be concluded in our next.)

HEARDER'S LECTURES ON THE INDUCTION COIL.

(Concluded from p. 269.)

The lecturer then proceeded to institute a comparison between the induction coil and the ordinary electrical machine, which it was now easy to do, since both instruments were capable of producing the same class of thermal effects. He exhibited a beautiful and most ingenious apparatus which he had contrived for this purpose. It consisted of a half-seconds pendulum, from the axis of which projected horizontally two long insulated copper wires, placed about two inches apart, and having their ends bent towards each other, and brought within a short distance of the opposite sides of the periphery of a revolving disc of paper. Whilst the pendulum was oscillating, the reiterated discharges of the jar were made to pass between these points through the paper, and as the paper rotated, regular curves, each indicating a second of time, were formed by the series of perforations thus made, and the number of these in a curve gave the number of discharges per second. These varied with the rapidity of the vibrations of the interrupting spring, and occasionally amounted to as many as 200 per second. The value of each discharge could be determined by the thermo-electrometer. To compare this with the electrical machine, it was only necessary to ascertain how much surface of glass required to be rubbed in order to produce a discharge from the same jar, equivalent in effect to a single discharge from the induction coil, and to multiply this by the number of discharges which the coil would give per second; and in this way he had calculated that the instrument then in use was equivalent to 1,200 or 1,400 plate electrical machines of 24 inches diameter.

Mr. Hearder next invited the attention of the society to some phenomena of a most contradictory and inexplicable character. He insulated two Leyden jars, and connected their outer coatings respectively with the two terminals of the coil, using the knobs of the jars themselves as terminals. On bringing these near enough to allow sparks to pass between them, each jar might have been expected to have received a strong charge, the one plus and the other minus; but this was not the case, for the charge imparted was extremely feeble, although the sparks between them kindled inflammable substances, in the same manner as the terminals of the coil. The knobs of the jars were then respectively connected with the inner and outer coatings of a third Leyden jar, and on connecting a thermo-electrometer with this last jar, discharges passed through it, and raised the fluid eight or ten degrees, though on trying the jars subsequently no charge was found to have been communicated to them. The Lecturer said he was quite at a loss to account for the occurrence of these phenomena through the intervening strata of glass; he had only recently observed the phenomena, and they were quite inexplicable by any of the present theories of electricity.

The Lecturer concluded by enumerating some of the practical purposes to which the induction coil was applicable: he looked upon it as the only instrument, either in its present or some modified form, which would be adapted to work the submarine American telegraph, and that its enormous power and capability of overcoming resistances adapted it admirably for all kinds of extended circuits. As an agent also for blasting at a great distance, it was incalculably superior to any other electrical instrument, as the experiments in France with apparatus of comparatively feeble power had sufficiently shown.

At the conclusion of the lecture, Mr. Hearder said, that he was sorry to allude to a matter of a personal nature, but that he had been almost called upon to do so by a gentleman then present, Dr. Noad, who had felt himself aggrieved by some animadversions which he, Mr. Hearder, had made on his conduct in a recent paper on the induction coil, which he had published in the *Philosophical Magazine*. Under these circumstances he trusted that the society would pardon him for thus publicly introducing the sub-

ject. The facts were briefly these: That in March, 1856, Dr. Noad lectured at the Plymouth Mechanics' Institute, and there contrasted an induction coil which he, Mr. Hearder, had made with one of Ruhmkorff's, and pronounced Mr. Hearder's machine to be vastly superior; that Mr. Hearder had, at Dr. Noad's request, furnished that gentleman, not only with the particulars of the construction of his instrument, but with his views respecting the rationale of its action, for the purpose of publication in a new work which Dr. Noad was then preparing, and which he said would appear early in the following month, April; and that Dr. Noad had also induced him to promise not to publish any particulars of his instrument until his new work had appeared. Mr. Hearder kept his promise, and waited patiently for the appearance of the work, and in the mean time, considerably increased the power of his machine. After waiting six months, he wrote to Dr. Noad, communicating his new improvements; and, feeling apprehensive that the delay of Dr. Noad's book might afford an opportunity for some one to forestall him, he determined on going to the meeting of the Royal Cornwall Polytechnic Society to exhibit his coil.

Whilst there, a letter from Dr. Noad was forwarded to him, stating that a young gentleman had, a few days previously, brought him an induction coil of his own construction to try; that he had tried it, and found it possessed of considerable power; and that he was going to lecture on the subject at the Royal Polytechnic Institution in the course of three weeks, and there introduce the machine. Upon this Mr. Hearder immediately wrote to Dr. Noad, and stated his hope that, since the delay in the publication of his book had been the means of keeping his (Mr. Hearder's) machine from the public for more than six months, he would at least do him the justice to give him credit for priority; and informed Dr. Noad that he had just received the first silver medal from the Royal Cornwall Polytechnic Institution. Dr. Noad, however, gave the lecture, and introduced his friend's machine, but did not think fit to make the slightest allusion to Mr. Hearder's labours. On learning this fact, and that Dr. Noad had also exhibited the same machine at other institutions without any allusion to Mr. Hearder's experiments, he at once published an account of his investigations in the *Philosophical Magazine*, and prefaced his remarks by an allusion to the foregoing circumstances.

These remarks had been construed by Dr. Noad into an accusation of plagiarism, and Mr. Hearder was desirous on the present occasion of removing such an impression. He did not mean to accuse Dr. Noad of plagiarism, but he felt that Dr. Noad had not done him justice; he was at the same time, however, willing to believe that the injury which had been inflicted had not been contemplated.

The novel and extraordinary character of Mr. Hearder's experiments, both at the London Institution and the Society of Arts, appeared to take the scientific *savans* by surprise, and it was felt that it would have been scarcely credible a few years since, that the electro-magnetic machine, or induction coil, as it is now called, would ever have been capable of developing such remarkable effects. Ruhmkorff may have the merit of having given an impetus to the present inquiries, but certainly equal, if not superior merit is due to Mr. Hearder, for having correctly applied principles and developed phenomena which Ruhmkorff did little more than faintly shadow forth. We cannot conclude our report without expressing our regret, that Mr. Hearder should have so unfortunately trammelled himself by his promise to Dr. Noad; first, because it has deprived the scientific world, during a period of nearly twelve months, of important facts which might by this time have been extensively circulated and applied; and secondly, because Dr. Noad's unhandsome treatment of him, in suppressing his discoveries and unduly forestalling him by thrusting another before the public in his place, have inflicted an irreparable injury upon Mr. Hearder, and prevented him, as a manufacturer, from reaping that commercial benefit from his inventions and discoveries to which his energy and talents fairly entitle him.

Dr. Noad's book has only appeared within the last few weeks, and in it we find, as we stated in our Review of it, an account of Mr. Hearder's machine in the comparatively immature state in which it emanated from his hands more than twelve months since, and not, as we might reasonably have expected from so new a work, in the improved and powerful form which has excited the astonishment of all who have witnessed its effects. We really think that, if the above statement of Mr. Hearder be correct, Dr. Noad owes a public apology, not only to Mr. Hearder, but to the scientific world in general, for the loss which both have sustained through his instrumentality.

PATENTS IN AMERICA.

The Report of the American Commissioner of Patents, the Hon. C. Mason, to the Speaker of the House of Representatives, is now before us, and affords another instance of the exemplary industry and ability of that gentleman. The following extracts will be seen to have much interest for the British public, showing, as they do, that the Americans are gradually but surely approximating to the enlightened policy adopted by our own Commissioners:

"The condition of this office remains nearly the same as at the time of my last annual report. The business has been constantly increasing, but the force employed has thus far been found adequate to its prompt and thorough discharge.

"The accompanying tables also show that the business of the office has increased during the year in about the usual proportion. There have been 525 more applications, 118 more caveats, and 478 more patents than in 1855.

"It will be seen that the patents have increased in a much greater ratio than the applications. In other words, there have been proportionably fewer rejections than during the previous year. This is probably attributable, in a very great degree, to progress made (both in and out of the office) in the knowledge of the proper principles and rules in accordance with which patents should be granted or refused.

"The following table will show how the number of patents in the United States compares with those in England and France for several years past:

Table showing the number of Patents granted in England, France, and the United States, respectively, during the last ten years.

Year.	England Patents.		United States. Application for Patents.	United States. Patents Granted.	France. Patents.
1846	493		1272	619	2088
1847	493		1531	572	2159
1848	388		1628	660	853
1849	514		1955	1076	1477
1850	513		2193	995	1687
1851	355		2258	869	1836
1852	469				
	Amendment Act. Applications for provisional protection.	Patents passed thereon.			
1852	1211	914	2639	1020	2160
1853	3045	2185	2673	958	3111
1854	2764	1876	3324	1902	3499
1855	2958	2044	4435	2024	4056
1856	——	——	4960	2502	——

"The number of patents issued from this office has now grown to exceed those granted by the English office, and the number of applications is greater than are made to that of France. In these two countries there is no examination of applications in the manner practised here, and nearly all patents applied for are granted.

"Most of our present laws and regulations relative to patents have been derived from England, and it is probable that other features of their system might be studied with advantage as a means of improving our own.

"One of these is the provisional protection or temporary patent for six months. This is somewhat in the nature of our caveat; but if modified so as to be adapted to our system, would be found an improvement upon our present practice.

"Another feature of both the English and French regulations is, that the patent fee is paid by instalments, thus allowing the patentee, in effect, to surrender his patent whenever he finds it is of less value than the instalments still unpaid. A large majority of patents are worthless. The course pursued in England and France permits the inventor to feel his way, by degrees, venturing from step to step with the power of retreating at any moment he feels inclined to do so.

"In this manner the revenues of the Patent Office are paid in a larger proportion than under our practice, by those who derive most advantage from their patents, and can therefore best afford to pay them. If the same regulation existed here, the fee paid in the first instance might, in such cases, be reduced to a much smaller sum, in order to produce a given revenue, than under the present system. But the greatest advantage presented by such a regulation, is, that it would wipe out of being, at an early stage of their existence, a large proportion of patents which are worthless and unused, and only stand in the way of other inventors.

"Something in the nature of the English writ of *scire facias*, might also, with advantage, be incorporated into our law. At present there is no power in this country to repeal a patent under any circumstances. Although the very day after it has issued it should be ascertained that the invention was pirated by the patentee from the real inventor, or although for any other cause the patent may have been erroneously granted, it must remain in existence the whole period of fourteen years. It is true, in these cases, the patent would be invalid, and if granted to the wrong person, another patent may be issued to the real inventor. Still, the invalid patent is allowed to exist, and may be made productive of much mischief, enabling the holder to impose upon the public, either by the sale of a worthless patent, or by extorting money for permission to use the invention, which most persons would pay in preference to engaging

in litigation with the holder of a patent, in pursuance of the statute, and allowed by law to continue its existence.

"Another regulation of the English Patent office which deserves to be imitated, is that by which all the patents that are issued are directed to be printed separately, and sold at prices which will merely defray expenses. I regard such an arrangement as being in an eminent degree useful and desirable. To make the system complete, however, a like publication should be made of all previous patents, and also a complete analytical index of the whole. This would indeed be a work that would be worthy of the office and of the country. I feel a strong desire and oonfident hope that this work will soon be commenced, and consummated with all convenient dispatch.

"Some of the other regulations of the English and French Offices are of more doubtful expediency. Among these is the entire dispensing with all examinations, such as are made in this office. Such examinations are, doubtless, productive of much good; but I am every year yielding more and more to the conviction that the decisions of the office in reference to patentability, should not be peremptory, but merely advisory, and that some system like that suggested in my last annual report might, with great advantage, be substituted for that now in force.

"But radical changes should be made with caution, and upon the clearest convictions that such changes will prove salutary; I am therefore hardly prepared to urge such alterations at once. But I feel firmly impressed with the belief that we shall come to this result at last, and that the right of an inventor to protection will not be left to the arbitrary determination of any officer under the Government.

"The propriety of changes in the rate of patent fees has been urged upon the attention of Congress in several of the last annual reports, and nothing new suggests itself to my mind on that subject at present. Fully confident that the changes recommended would prove salutary, and that a rate somewhat increased over that now in existence, is actually necessary to enable the office to effect completely the purposes for which it was established, the favourable consideration of Congress is again invited to this subject."

ON THE CONSTRUCTION OF BOOTS AND SHOES.

BY A CORRESPONDENT.

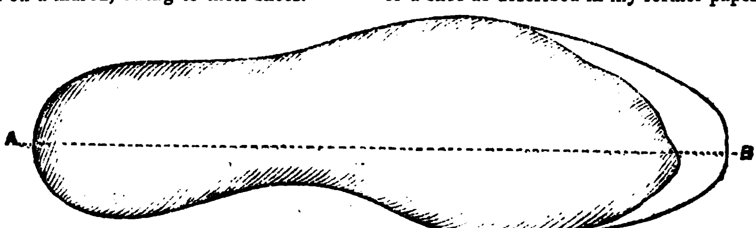
In the *Mechanics' Magazine* for 5th July, 1856, will be found a paper of mine on the above subject, illustrated by a diagram. Unfortunately, that diagram is not a very accurate reduction of the drawing I sent, which was full size; and this has caused the subject to be misunderstood by several persons.

That paper having given rise to much discussion, I beg to give some additional information, and to show what might be done to introduce the principle of cutting the sole of a shoe as described in that paper into general use—particularly into the army.

I do not know that I should have taken up the subject again, had I not lately seen tens of thousands of army shoes, all cut on what appears to me to be a false principle, and had I not lately had a description from an officer of the miseries suffered by his men on a march, owing to their shoes.

In this discussion I shall bring the art of drawing to bear, and treat the question somewhat in a mathematical style. The subject has evidently never been treated in that manner before; and there is the reason of the evils that are suffered. Shoes have been left to shoemakers, who cut and work as mere mechanics, without correct rules to guide them. Tailors aspire to cut upon geometrical principles; but the shoemaker seems to have no such ideas. The time, however, has arrived when no man must think himself safe in his trade while working by the old rule of thumb. Society now expects that every workman shall work upon correct principles, and be able to give a good reason for what he does.

The following diagram is given as a demonstration of the principle of cutting the sole of a shoe as described in my former paper.



The part hatched shows the actual tread of the foot, as obtained by setting the foot

on paper and drawing a line round it. Now the only line that can possibly be drawn for a sole of ordinary fashion that shall fit this outline of the foot, is that shown by the thick line. For, suppose a straight sole be drawn to enclose the actual outline of the foot, then the line AB would be the middle line; and if equal and corresponding distances be set off on each side of that line, to form the straight sole, it is evident that the natural outline must be departed from, and misery to the foot must inevitably be the result. This is not a matter of opinion, but of eyesight and drawing, not to be disputed.

Following the above demonstration, it is very easy to secure that a shoe shall fit. For, by setting the foot on paper, and drawing a line round it, we get a *plan* of the foot, and if this outline be extended enough at the toe end to make the sole sufficient to give protection and ease, we then have a *plan* of the last required; and if the last be formed in *section*, according to the cross measurements of the foot, taken by a strip of paper in the usual way, the last will be an exact mould on which to work the shoe. The formation of the last is thus made a simple question of plan and section.

But now comes what seems to be an insuperable objection; for people might suppose, from a hasty glance, that a shoe formed as suggested would have a crooked, inelegant appearance. The fact is quite the reverse. The sole is not seen, being under the foot, of course, while the upper part of the shoe, being an exact fit, without either unequal pressure or any waste of room, exhibits the foot in its smallest possible size, and gives it a neat, compact, and finished appearance. Under any circumstances, this mode of cutting the sole makes the best of a foot as regards its appearance; and, if adopted in early life, the foot would be preserved from those distortions which cause it to be painful and unsightly in after life.

It has also been mentioned, as an objection, that shoes for an army, or for general sale, could not be cut from actual plan and section of the foot as proposed. In reply to which I would beg to say, that it is just as easy to keep thousands of shoes of various sizes, with the soles cut in proper shapes, as to keep them ready in any other form. If I had to shoe an army, I should proceed thus:

1. Take the outlines of the feet of ten, twenty, or more men, in the manner that has been explained.

2. With a pentagraph reduce all these outlines to one exact length, so that the differences in form may admit of being compared.

3. From these outlines make a mean outline, and then will that be a correct type in plan of the human foot.

4. Complete this mean outline into the proper form for a sole, as suggested above.

5. Now enlarge and reduce this latter outline into about six sizes for the soles; and if for each size of sole, about three variations in the quantity of upper leather be made, there would be eighteen varieties of shoes, but all cut upon the principle of nature.

In this mode of forming the soles there is no waste of leather, as might be supposed; for they cut out of one another.

In the army many thousand pounds a-year would be saved; for shoes cut as proposed, and the heels formed as shown in my first paper, wear a great deal longer than shoes formed in any other manner, with the advantage of always looking whole and neat to the last. S. B. H.

Chelsea, March 20, 1857.

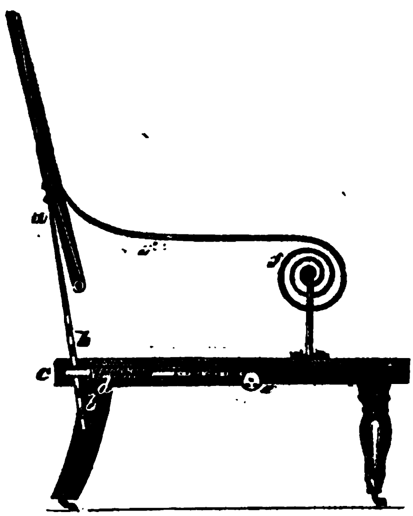
PROPOSED SUBAQUEAN SEWER FOR THE METROPOLIS.

In a communication addressed to the Government Referees on Plans for the Main Drainage, &c., by Mr. W. Burch, of the Chase Side Works, Enfield, Middlesex; that gentleman proposes that the main sewer shall be carried chiefly along and under the bed of the Thames itself, and describes a plan by which the bed of the river could, with facility and cheapness, be laid dry in order to make the necessary excavations for laying the sewer. The means he proposes for getting access to the bed of the river, consist of what he terms a Portable Vertebrated Dam: "Portable" because capable of being moved as the work was finished; and "Vertebrated" or in parts (say four or five) so that by continuously shifting only the last part forward as the work progressed, the onward movement would be effected without any interruption of the workmen engaged in laying down the sewer. The dam would be furnished with air chambers to give buoyancy when required to be shifted, and (this being the chief practical question) a "secure junction" between the bottom of the dam and the unlevel bed of the river, so as to resist the great pressure from the outside, and prevent leakage, might be obtained by having all round the lower part of the dam a series of strong plates, sliding in each other, and also having guiding slides fixed on the dam, so that they could be lowered down perpendicularly and forced into the soil to the depth of a few feet. These slides presenting a tolerably fair surface outside, he would have a strong flexible waterproof curtain to let down over the slides as far as the river bed, and thence to lie outwards for a few feet flat on the river bed. On this flat part he would deposit so much of the sur-

plus of the excavated soil as, together with the filtering in of the river mud, would make all secure from leakage; and protect that deposit (where necessary) by placing over it bags filled with clay or gravel to break the wash of the tide.

WEBB'S PATENT RECLINING CHAIRS.

Mr. W. Webb, of Wilson-street, London, has recently patented a very excellent improvement in the reclining chairs. The invention relates chiefly to reclining chairs with metal arms and backs, or back frames, though it might be applied to chairs with wooden back frames. It is shown in the accompanying engraving, and consists in lowering or altering the inclination of the back, and retaining it in the desired position by connecting to any convenient part of the back frame a rod or bar, *a a*, with perforations, *b b*, made in or



through the same, or with teeth formed thereon. This bar, *a*, is free to be pressed down through (or by) the side, *c*, of the seat frame of the chair and opposite to the rod or bar is fitted a spring bolt or catch, *d*, which taking into one of the apertures or teeth in or on the bar, retains the back in the desired position. The spring bolt is drawn back when required by a chain, wire, or cord connected to a handle, *e*, at the side or other convenient part of the chair. Instead of a spring catch a toothed pinion may be made to act on the rod or bar, to alter the inclination or height of the back.

The alteration in the position of the back is freely permitted by the spring arms, *f*, upon which, when the chair is completed, pads or elbow rests are fitted.

MAPPIN'S IMPROVED PANEL.

Mr. W. S. Mappin, of Birmingham, has recently patented an improved panel, designed to resist the action of burglars' tools, or to give strength wherever it may be desirable. The panel is made of pulp or other suitable material, and has embedded in it a layer of thin hard steel, capable of resisting the action of ordinary cutting tools. In making a full size panel the steel is not in one piece the size of the panel, but a series of strips, 1½ inch broad, is inserted at intervals, leaving a space of three quarters of an inch between the adjacent strips. The following are a few advantages the improved panel has over the ordinary wood panels; viz., a perfect resistance to sharp instruments used by burglars for cutting holes through doors, &c.; it will never shrink or twist, and it is well adapted for round or other curved panels, as they will never split. The price they can be manufactured for is much less than ordinary wood panels with iron plates screwed on. The material of the panel can be worked in every respect as pine or other wood.

STEAM SHIP ARITHMETIC.

To the Editor of the Mechanics' Magazine.

Sir,—With reference to the origin of the formula

$$\frac{V^3 \; D^{\frac{2}{3}}}{\text{Ind. H.P}} = C.$$

and in reply to the remark of "A Constant Reader" in No. 1753, viz., "I do not wish to undervalue Mr. Atherton's labours; and I think, on the other hand, he can hardly wish them to pass current as possessing a more original character than really belongs to them." I am enabled to meet that remark by the following extracts from "Steam Ship Capability," page 9, wherein, referring to the foregoing formula, I express myself as follows:

"The example set by the Admiralty in publishing and circulating a tabular record of the constructive elements and experimental trials of the screw ships of the Royal Navy has not been met or responded to by any similar publication on the part of the proprietors of mercantile fleets. That this omission on the part of merchant steam fleet proprietors is injurious to their own interests may be inferred from the great advantages which have resulted to mining interests generally

by reason of the periodical publication of the constructive elements and working operation of mine pumping engines, and the interests of steam-ship proprietors and of mine proprietors being analogous as regards the management of their motive power, it can scarcely be doubted that steam ship efficiency would be greatly promoted by the engineering and ship-building rivalry that would unquestionably be consequent on the locomotive DUTY of all steam ships being ascertained and *numerically* ranked as is the working duty of the Cornish pumping engines. Notwithstanding, however, the interests that would be served by such comparisons of steam-ship performances, the published reports of merchant steam-ship trials are generally so deficient of details as regards the ships' *displacement* at time of trial, and the *working* power of the engines corresponding to the *speed* attained, that such records rarely afford the complete data on which any conclusion as to the real merit of the vessel can be satisfactorily deduced. The test of relative merit being determined by the index number resulting from the formula

$$\frac{V^3 D^{\frac{2}{3}}}{\text{Ind. H. P.}}$$

by which the screw ships of the ROYAL NAVY have been compared."

My labour in this matter, and which, so far as I know, is original, and was primarily brought before the public by my Essay on "Steam Ship Capability," consists in my having utilised this formula, so as to embrace the compound combinations of displacement, power, speed, and distance, in connection with the *£ s. d.* expenses incurred, thereby constituting a system of arithmetic adapted to the requirements of mercantile steam ship service, by developing a process, whereby merchants may calculate the prime cost expenses of conveying cargo per ton weight, as affected by different combinations of size of ship, length of passage, and speed required. I admit that this system of steam ship arithmetic, as exemplified in Tables K. L. M. pages 78, 84 and 87 of "Steam Ship Capability," is, when once pointed out, a very simple affair, so much so, that I hope to see steam ship arithmetic made a subject of rudimentary mercantile education and an essential acquirement on the part of every person who assumes the direction of steam shipping affairs; and it was with this view that I followed up the subject by my papers read before the Society of Arts, London, May 16, 1855, and January 16, 1856, and by my paper on Mercantile Steam Transport Economy, read before the British Association, at their Cheltenham meeting in August last.

Your correspondent, "A Constant Reader," further objects to my having designated the coefficient (C), which results from the formula

$$\frac{V^3 D^{\frac{2}{3}}}{\text{Ind. H.P.}} = C$$

as the index number of dynamic "duty," instead of using the term "performance," observing as follows:

"The only use of the new term that I can see, is to involve the origin of the formula in obscurity, and to give an appearance of novelty and originality to Mr. Atherton's labours to which they are not altogether entitled."

The foregoing explanation will, I hope, induce your correspondent to put a fresh construction on my motives. As to the nomenclature itself, by which I have endeavoured to develope and explain this system of "Steam Ship Arithmetic," I judged it to be appropriate to call the co-efficient (C), on which the calculations are chiefly based, and which is not necessarily a constant number when applied to vessels of a different type, and not similarly circumstanced, by the term "Index Number," thereby implying its variability; and as the index number may be greater for a vessel of 500 tons displacement, such as H. M. Ship *Reynard*, than it is for a vessel of 5,000 tons displacement, such as H. M. Ship *Duke of Wellington*, whilst the "performance" of a vessel of 500 tons could not in the general acceptation of the term "performance" be conceived to be greater than the performance of a vessel of 5,000 tons, the term "performance" might therefore mislead; and this was one reason for my having denominated the co-efficient resulting from the formula referred to as the index number of "Dynamic Duty," rather than call it the index number of "performance." Moreover, by thus adopting the term "Duty," the index numbers of "Dynamic Duty," indicate the relative degree of merit that may attach to the locomotive operation of steam ships analogously to the sense in which the index numbers of working "Duty" indicate the relative degrees of merit which may be due to the principle and operation of Cornish pumping engines, the relative working efficiency of which engines have for fifty years past been denoted by the term "Duty." Following therefore the established precedent of nomenclature used for analogous objects, I have adopted the term "Dynamic Duty," in preference to the term "performance;" and for the reasons above stated, I regard it as the least liable to mislead others in their studying and prosecuting the system of steam ship arithmetic which I have endeavoured to inculcate; the only question with me is, whether it ought not to be called the "Index Number of Constructive Merit"—that is the term which would do most public good in the quickest time.

I am, Sir, yours, &c.,

CHARLES ATHERTON.

Woolwich Dockyard, March 17, 1857.

THE WESTMINSTER CLOCK AND BELL.

To the Editor of the Mechanics' Magazine.

SIR,—The tone of Mr. Denison's last letter relieves me from the task of continuing to notice his remarks.

Hitherto I have replied to these letters at length, and given references and proof for the statements advanced; although, from the first, the tone has not been inviting, while he has sought to detract from the facts revealed by resorting to assertion and epithet instead of bringing forward evidence and proof. My last reply has, however, appeared in this Magazine, of March 14th; and the remarks I have yet to make on the Westminster clock and bell, at some future time, will not, therefore, be lengthened or drawn aside from the subject by any measure of unsupported abuse to which he may descend.

I need only add, that much time has been occupied, and great care taken to render my letters as accurate as possible; and if they be compared with the parliamentary papers and other documents referred to, the accuracy of the statements, from the first to the last, will bear testimony to the care having been well bestowed.

E. T. LOSEBY.

5, Fitzroy-terrace, Kentish Town,
March 24, 1857.

[We think it only fair to state (as Mr. Loseby has not mentioned it), that in a letter to the *Times*, of the 8th Nov., 1856, Messrs. Warner and Sons, the founders of the Westminster bells, say, "You intimate that the weight of this large bell is 15 tons —its exact weight is 15 tons 18 cwt. 1 qr. 22 lbs., *and the four quarter bells, now in progress, will together weigh nearly as much more.*"—ED. M. M.]

SPECIFICATIONS OF PATENTS RECENTLY FILED.

SEYMOUR, E. *Improvements in the construction of furnaces.* (A communication.) Dated July 17, 1856. (No. 1685.)

Claims.—1. Supplying closed furnaces with hot air, by causing the supply of air to pass through hollow fire bars. 2. The use of hollow supporting pipes for feeding steam boilers with water.

NEWTON, A. V. *An improved regulator for heating apparatus.* (A communication.) Dated July 17, 1856. (No. 1686.)

A section of the exit steam pipe from a building or room fitted with steam or hot water heating apparatus is so arranged that the pipe itself shall open or close a valve, and thus restrain the escape of steam and water, and thereby regulate the heat.

CAREY, C. *Improvements in the vessels and filters used for making infusions of coffee and other substances.* Dated July 17, 1856. (No. 1687.)

There is an outer pot into which an open frame fits, and over this frame a bag of muslin is drawn. The infusion is made by placing the ground coffee in the bag which is placed in the pot; boiling water is then poured on it, and allowed to stand for a short time; afterwards the bag is lifted out, and the pot is covered by a perforated strainer, through which the bag drains. The infusion is then ready for use.

LEUCHARS, W. *Improvements in locks for travelling bags.* Dated July 18, 1856. (No. 1690.)

To the cases of Bramah and Chubb locks are fitted certain novel mechanism in connection with the bolt of the lock, so that the bolt may either be used by hand, or operated upon by the key of the lock.

HIPKINS, G. F., and J. BRITTEN. *Improvements in applying springs or weights for the purpose of closing doors or resisting shocks, strains, or pressure.* Dated July 18, 1856. (No. 1692.)

This invention cannot be described without illustrations.

COWLEY, J. *Improvements in the manufacture of paper from straw and other vegetable substances.* Dated July 18, 1856. (No. 1693.)

The principal object here is the construction of an apparatus by which the straw intended for pulp may be subjected to a very high degree of temperature, and maintained thereat. The apparatus consists of coils of pipe heated in a furnace, in which pipe the alkaline liquor is heated.

DESVIGNES, P. H. *Improvements in machinery for scutching or beating flax, hemp, and other fibrous materials requiring like treatment.* Dated July 18, 1856. (No. 1694.)

The flax, &c., is moved towards or from beaters, mounted on axes carried by endless chains or bands, or on the periphery of a rotary cylindrical frame, and the beaters are caused to rotate or vibrate with their axes, when they come opposite to where the flax is held, by means of fixed racks, into which the teeth of pinions (fixed on the axes of the beaters) take.

BIRKBY, W. B. *Improvements in filleting and fixing pointed teeth in the fillets used in the preparation of flax, tow, hemp, and other fibrous substances.* Dated July 18, 1856. (No. 1696.)

The fillets are each made of two layers of sheet iron having between them canvas, paper, or other yielding substance. The holes to receive the pointed teeth are punched through the whole, and at the back

end of each tooth are pressed up, or spread at the back of the fillet. The holes are inclined, that the teeth may be so.

HAMILTON, J., jun. *An improvement in the bending of sheet iron for the manufacture of conical tubes.* Dated July 18, 1856. (No. 1697.)

Conical rollers, by preference of steel, are employed. The sheet metal is passed between them, and is bent around one which is supported on two other conical rollers.

CROCKETT, J. L. *Improvements in evaporating.* (A communication.) Dated July 19, 1856. (No. 1701.)

To prevent the deterioration of pans arising from the incrustation of deposited matter, several pans are arranged side by side, and covered by a top which forms the floor of the main heating flue, the pans being heated from the top only. Above is an arched hot-air chamber, which communicates by flues on one side with the interior of the pans near their upper part, for promoting a rapid surface evaporation of the liquid. This hot air, with the steam arising, is carried off by passages on the opposite side, communicating with the chimney. Each pan has a door through which the matter deposited is removed.

CLARK, W. S. *Improvements in machinery or apparatus for digging, pressing, and moulding peat.* (A communication.) Dated July 19, 1856. (No. 1704.)

For digging, a number of parallel blades are secured to a stem or handle, and a moveable one cuts the remaining side, and turns under the ends of the parallel blades, cutting off the bottom, and holding the cut portion between the blades when they are raised. A working or mixing apparatus is used for making the peat into the muddy consistency for making "brand peat," in connection with a cylinder and piston for pressing it through or into a mould. These are connected with a carriage crane and receiving-car or platform, and a track laid temporarily where the machine is used.

CROCKETT, J. L. *Improvements in the manufacture of sulphuric acid.* (A communication.) Dated July 19, 1856. (No. 1705.)

This relates to an improved furnace and tank for effecting the concentration of sulphuric acid, whereby the destruction of the leaden chambers hitherto employed, or the use of platinum stills, is obviated.

WHITEHOUSE, J. jun. *Certain improvements in making, mounting, and spindling knobs, applicable for doors and other purposes.* Dated July 19, 1856. (No. 1706.)

In knobs made in parts, the larger or globular portion is to be of glass, china, bone, ivory, wood, horn, &c. The arrangements of the parts cannot be described without illustrations.

JUMP, W. A. *Improvements in the manufacture of salt.* Dated July 19, 1856. (No. 1707.)

This consists in certain arrangements of pans or boilers, and furnaces connected with the boiling and concentration of brine and the heating of salt water.

JUMP, W. A. *Improvements in apparatus for supplying with fuel the furnaces of steam boilers, and other furnaces, and in the method of cleaning the fire bars thereof.* Dated July 19, 1856. (No. 1708.)

1. An improved mode of supplying fuel to the fires by mechanical means is used; and, 2, an arrangement by which the fire bars may be cleaned without stoppage of the furnace fire is adopted.

SMITH, J., and E. HARRISON. *Improvements in machinery or apparatus for warping and beaming.* Dated July 19, 1856. (No. 1709.)

1. An additional heck is placed between the lease heck and the half-beer peg box. 2. The comb is soldered between every third dent to the depth of about half an inch, so that when the beamer has laid in the warp, by raising the comb a lease is made of one dent above above and two dents below, which enables him to introduce a pair of opening rollers which prevent the warp sticking or breaking the yarn whilst passing through the comb to the beam.

YOUNG, E. W. *Improvements in the construction of bridges.* Dated July 19, 1856. (No. 1710.)

The roadway of a bridge is suspended from chains which descend in straight inclined lines to the roadway. From these chains, at intervals, inclined suspending rods descend to the roadway, and the chains are supported at intervals by uprights supported by the roadway at points near the ends of the suspending rods.

PAPINEAU, W. *An improvement in the production of spirits of wine.* Dated July 19, 1856. (No. 1711.)

The starch of rice, grain, or other matters containing starch, is first converted into sugar, and the improvement consists of a process of distilling spirits of wine from fermented solutions of such sugar.

BROOMAN, R. A. *An improved method of supplying air to gas and other lights.* (A communication.) Dated July 19, 1856. (No. 1712.)

Gas and other burners are so arranged that only just a sufficient quantity of air to support combustion may be supplied to the flame, and that in a heated state, the necessary air entering through the upper part or top of the shade or globe of the light only.

LEAK, E. *A thimble pillar, with points and branches, to be used in placing "glost"*

china and earthenware in ovens and kilns, when firing, burning, or baking such ware, in lieu of the cockspurs and stilts now in use for that purpose. Dated July 21, 1856. (No. 1715.)

This invention consists, principally, of a series of thimbles or cuping pins formed of earthenware, having one or more points or branches projecting therefrom, for supporting the ware.

GAUDIN, M. A. A., and E. X. CHOUMARA. *Manufacturing factitious wholesome milk.* Dated July 21, 1856. (No. 1716.)

Artificial milk is made from meats, with or without bones, but chiefly with fresh marrow bones; and also from gelatine and grease, or oil, and from wax and resins.

BARBOUR, F. *Improvements in pen-holders.* (A communication.) Dated July 21, 1856. (No. 1717.)

To the pen-holder are fixed projections for the finger and thumb to rest against, which give the writer a steady hold.

FISHER, J. P. *Improvements in cues used in billiards, bagatelle, and other similar games.* Dated July 21, 1856. (No. 1718.)

The head or tip and the end of the stick are so constructed that the head can be readily removed and replaced by another.

CLARK, J. *Improvements in the manufacture of waterproof fabrics.* Dated July 21, 1856. (No. 1719.)

The patentee takes a piece of cloth and coats it with a waterproof composition (of India rubber or gutta percha, &c.), and then cuts out holes in this coated fabric, and unites it to another fabric non-waterproof. The complete fabric side is worn outside; rain does not penetrate the perforations, but runs down the surface, but vapour or perspiration escapes from the interior by the perforations.

RICHARDSON, R., and J. E. BILLUPS. *Improvements in the permanent way of railways.* Dated July 21, 1856. (No. 1720.)

Left and right-handed screws are applied in combination, in fixing the ends of rails by fishing plates—in fixing the parts of chairs together—in fixing rails to chairs, with or without fishing plates—and in fixing rails in chairs by wedges.

SIMPSON, F. *An improved mode of stopping bottles.* Dated July 21, 1856. (No. 1722.)

The neck of the bottle is so formed that the cork shall be securely held, and retain gaseous or volatile fluids without the aid of wires or strings. The neck of the bottle has an internal screw, and the part below the screw is of a conical form. When the cork is put in it is turned round two or three times, and becomes imbedded in the threads of the screw, the lower part of it completely filling the conical space below.

VERGNES, M. *Improvements in electro-galvanic machines for producing motion by galvanic electricity.* Dated July 21, 1856. (No. 1723.)

This consists in converting the oscillating movement of a double astatic galvanometer into a rotary one. In other words, in employing the rotary action of two or a greater number of electro-magnets, perpendicular to each other, and attached to a common shaft.

GREEN, W. *Improvements in treating, ornamenting, and waterproofing fabrics, and in machinery or apparatus for effecting the same.* Dated July 21, 1856. (No. 1724.)

These improvements consist in the preparation of surfaces for the reception of, and in the application thereto, of certain water repellent and other matters, whereby imitations of leather in one or more colours are produced; also in the production of enamelled water repellent surfaces, either plain or in various degrees of relief, to any desired pattern on portions only of plain, figured, or printed fabrics, and in machinery or apparatus for effecting the same.

HODGES, J. E. *Improvements in machinery for the manufacture of looped fabrics.* Dated July 21, 1856. (No. 1725.)

Claims.—1. The arrangement of circular knitting machinery in such manner as to turn or roll the work over the tops or heads of the needles, so as to allow the loops to be formed between the inside of the work and the outside of the needles, and between the outside of the work and the inside of the needles; and, also, so that one set of loops may be formed on the inside of both work and needles, while part of the work is on the outside of the needles, and at the same time (by another set of feeding apparatus) from another set of loops on the outside of the work and needles, while part of the work is on the inside. 2. The arrangement of circular-knitting machinery, whereby the loops are formed simultaneously on both the inside and outside of the needles and work.

NEWTON, A. V. *Improvements in machinery for reaping and mowing.* (A communication.) Dated July 22, 1856. (No. 1728.)

1. A peculiar sickle is employed for such machines. 2. An improved mode of attaching the knives or teeth of the sickle to the sickle-bar is adopted. 3. A traversing rake and a swinging rake are used in combination, for gathering up and discharging the cut produce from the platform.

AMET, C. *Improved means of distending articles of dress and preserving the form or shape thereof.* (A communication.) Dated July 22, 1856. (No. 1729.)

An apparatus is composed of a sufficient number of hoops or half hoops made of watch-spring steel, and suspended at inter-

vals from each other, terminating at the top by an elastic band.

COLMAN, S. *Improvements in steam boilers.* Dated July 22, 1856. (No. 1730.)

This consists in fitting in the flues of boilers at any suitable part beyond the fire-bridge a damper or dampers of such size that, when closed, they shall not entirely fill up the flue. Also, in the employment in the flue or fire-flues of Cornish boilers a supplementary waterspace or vessel.

WEISSKOPF, E. *An artificial combustible, chiefly applicable to the kindling of fires.* Dated July 22, 1856. (No. 1731.)

1. Resinous substances, such as colophany, combined with gall nut-dust, saw-dust, refuse tan, and other inflammable substances are used for an artificial combustible. 2. To the said substances are added perfumes for perfuming or fumigating apartments, &c.

COWPER, C. *Improvements in lighting and extinguishing gas lights.* (A communication.) Dated July 22, 1856. (No. 1732.)

Several gas burners are lighted simultaneously, or in very rapid succession, by electricity. Each burner has a cock which is opened and closed by means of an electric current, and an electric spark is passed through the issuing gas, or a fine platinum wire is ignited in the gas.

BURG, S. J. A. *Certain improved apparatus for preventing the explosion of steam boilers.* (A communication.) Dated July 22, 1856. (No. 1733.)

This apparatus consists of a combined steam and water gauge and alarm bell.

HINDLE, H. *Improvements in valves and apparatus for governing steam engines, and for increasing the safety of steam boilers.* Dated July 22, 1856. (No. 1734.)

This invention cannot be described without illustrations.

IMRAY, J. *Improvements in bending timber.* Dated July 22, 1856. (No. 1736.)

Claim.—The application of hydraulic pressure in conjunction with casings, and a flexible strap and chain, to the bending of timber, by causing a curved mould mounted on an axis, and attached to one end of a fixed piece of timber, to bend the timber upon its circumference, or by forcing a curved mould against the timber, while the timber is retained by rods at points towards each end.

CLARK, J. *Improvements in the manufacture of beds, mattresses, cushions, and seats.* Dated July 22, 1856. (No. 1737.)

The patentee describes detailed methods of forming air-proof, water-proof, and non-water-proof beds, &c.

BRAYSHAY, J. *Certain improvements in boilers for generating steam.* Dated July 22, 1856. (No. 1738.)

Two or more rows of small cylindrical or other shaped vessels are arranged one above the other, and connected by pipes, or otherwise, so that the water and steam may circulate from one vessel to the other; and the flues between and around the vessels are formed in a peculiar manner.

NORTH, G. *An improved spring catch for the security of jewellery and articles of personal ornament and general utility.* Dated July 23, 1856. (No. 1739.)

This invention cannot be described without illustrations.

BERTHIEZ, S. F. *An improvement in engines to be worked by a new elastic fluid in substitution of steam generated out of water.* Dated July 23, 1856. (No. 1740.)

The patentee takes sulphuric ether, and dilutes it with water having in solution a quantity of soda, potash, empyreumatic oil, and some animal fat, and in some cases also bicarbonate of soda and tartaric acid. These are well mixed and put into the boiler. The vapour produced passes from the boiler, acts upon the piston in the cylinder in the usual way, and then passes into an air-tight vessel, where it expands, and loses a portion of its heat; it is then conducted into a condenser, and is again pumped into the boiler, and so on.

POTTS, F. *Certain improvements in tags for stay and other laces, as also in the machinery for forming and finishing the same.* Dated July 23, 1856. (No. 1741.)

This invention cannot be described without illustrations.

WEBSTER, W. *Improvements in pumps.* (A communication.) Dated July 23, 1856. (No. 1744.)

This relates to a pump serving all the purposes of the ordinary lift and force pump, and applicable as a fire engine. Projecting or raised circular valve seats are used in combination with elastic ball or spherical valves, which fit on to their seats closely, and operate freely without danger of choking.

MABIE, G. *Improved machinery for mowing and reaping.* (Partly a communication.) Dated July 23, 1856. (No. 1746.)

Claims.—1. Certain means for preventing a side draught in reaping machines, and preserving the balance of the parts. 2. The use of a castor or swivel wheel for sustaining the draught pole, and facilitating the turning of the implement. 3. A mode of constructing and applying the guard fingers. 4. A knife or blade, capable of cutting in the rear as well as in advance of the sickle bar.

DOUBLEDAY, H. *An improvement in the manufacture of starch.* Dated July 23, 1856. (No. 1748.)

A quantity of bran, or husks, or like dry matters (which, by combining with the gluten, will render it more permeable to the water) is added to the flour or meal employed, by which means the starch may be washed out by water more readily than heretofore, and fermentation and chemical menstrua may be dispensed with.

DERBYSHIRE, J. *Improvements in cocks, taps, and valves.* Dated July 23, 1856. (No. 1749.)

A tube of vulcanised India rubber is enclosed in a box slightly shorter than its length when uncompressed, so that it presses and makes a fluid-tight joint against the top and bottom of the box. Through a hole in the top of the box a spindle descends, and passing through the tube is secured beyond it by a nut. By means of a lever or key the spindle may be drawn up so as to raise the end of the tube from the bottom of the box, and thus uncover a hole therein, through which the fluid escapes.

ASHMAN, J. *Improvements in the manufacture of artificial limbs.* Dated July 24, 1856. (No. 1754.)

The material used is hide, treated with a solution of naphtha and gum shellac, or other gums dissolved in alcohol; or papier mache, or vulcanite may be used.

BURTON, C. *Improvements in warming houses and other buildings.* Dated July 24, 1856. (No. 1755.)

Air is led by a shaft from the top of the building to a chamber in the basement, in which is a fire surrounded by reflectors concentrating the heat to warm the air, and from this chamber the warmed air is conducted by turned pipes to the rooms to be warmed. The air is forced down to the warming chamber by a screw put in motion by the wind.

BOUSFIELD, G. T. *An improvement in the manufacture of driving straps or bands.* (A communication.) Dated July 24, 1856. (No. 1756.)

The object is to form a material, as nearly like leather as possible, susceptible of being made of any length in one piece, and presenting a better friction surface to the drum over which the belt passes than any belts now in use. The material used is India rubber, compounded with the cotton or fibres of flax.

BOUSFIELD, G. T. *Improvements in the manufacture of flexible hose and tubes.* (A communication.) Dated July 24, 1856. (No. 1757.)

The improved hose is made by machinery, without any seam and without any folds, from India rubber mixed with fibres of cotton or flax.

COLLIER, G., J. CROSSLEY, and J. W. CROSSLEY. *Improvements in finishing and stretching woven fabrics.* Dated July 24, 1856. (No. 1758.)

These improvements comprise methods of effecting the folding commonly called rigging or laying of the fabric selvage to selvage in the finishing process, and of operating upon such fabrics after being rigged. Also, means for stretching such fabrics by distending them breadthwise.

COPELAND, G. A. *An improved safety blasting cartridge, for the use of miners and quarrymen.* Dated July 24, 1856. (No. 1759.)

This cartridge requires engravings to illustrate it.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

JAY, S., and G. SMITH. *Improvements in the manufacture of skirts, petticoats, mantles, and such like articles of ladies' dress.* Dated July 18, 1856. (No. 1689.)

To ladies' articles of dress are adapted inflated objects, such as short tubes, or small spheres filled with air, and arranged independent of each other.

MEHREL, E. *Improvements in hand planes.* Dated July 18, 1856. (No. 1691.)

Arrangements are used for permitting the fixing of the plane iron in the wood of the plane at any suitable height, by means of a thumb-screw acting nearly vertically on the iron, passing in a hole in this latter, and kept in position by means of a tail or nut which enters into a groove in the wood, or is fixed across the opening for the plane iron.

GERBER, J. *Improvements in printing, dyeing, or impregnating fabrics, yarns, and threads, and in preparing metallic and other powders to be used for these purposes.* Dated July 18, 1856. (No. 1695.)

This consists in printing woven fabrics with a metallic powder mixed with a suitable vehicle, such as albumen, and in a method of preparing certain metallic and other powders suitable for printing or dyeing fabrics and yarns.

MCMASTER, W. and J. *An improved apparatus for retaining and releasing cords of window blinds, or cords, bands, or chains employed for other purposes.* Dated July 19, 1856. (No. 1698.)

A case or box enclosing a roller, running loosely from end to end, has upon one interior surface an inclined plane, to render the interior smaller at one end than the other, and the cord is so arranged as to be jammed by this roller at the small end of the case when at rest, and to run free of the roller when pulled upon.

HOPPER, G. *Improvements in railway*

pins or spikes. Dated July 19, 1856. (No. 1699.)

The pin or spike is rolled out of a bar of iron by suitable swagging rolls (according to a patent dated 6th June, 1855). These rolls form a groove in the flat side of the bar, leaving the metal thick at the middle part of the bar's length for forming the neck of the pin. The bar is then bent double in the form of a staple, and the grooves meet. A partially hollow pin, with a solid head, is thus formed, and the extremities are bevelled inwards, so that on driving the pin the two limbs may open out and lock the pin.

ARMOUR, J. *Improvements in bleaching, washing, or cleansing textile fabrics and materials.* Dated July 19, 1856. (No. 1700.)

The circumferential portion of a common dash-wheel case is made double, or with an annular casing. The shaft of the wheel is tubular, for admitting steam, hot-air, or hot water to the enveloping casing, so that the wheel may be kept constantly heated.

NOTON, W. *Certain improvements in self-acting mules, and other machines of the like nature, for spinning and doubling.* Dated July 19, 1856. (No. 1702.)

A flexible bar of metal is attached to the shaper rail, by screws and nuts, or otherwise, so that it can easily be adjusted to the form required. By this means the shape of the cop may be varied, and repairs made with facility.

RYDER, J., and D. BENTLEY. *Improvements in machinery and apparatus for folding and measuring fabrics.* Dated July 19, 1856. (No. 1703.)

The principal feature here is the application of two chambers, in which a partial vacuum is formed alternately, and which are furnished with adjustable spouts at the required distance apart.

ILIFFE, H. J., and J. NEWMAN. *Improvements in the manufacture of buttons.* Dated July 19, 1856. (No. 1713.)

For brace buttons, the inventors strike out a blank perforated with needle holes, and turn up the outer edge all round. They then form from sheet metal or wire, a skeleton piece like the figure 8, or a piece with two or three loops. The head of each loop is flattened to form a small fin, and the skeleton piece is dropped into the blank, and secured by pressing down the raised outer edge. They also make covered buttons by stamping out a shell with a double grooved or flanged edge.

WARREN, J., J. JONES, and B. CROWTHER. *An improved churn.* Dated July 21, 1856. (No. 1714.)

A churn box mounted so as to swing or rock is used by the inventors.

GEDGE, J. *Improvements in obtaining and applying motive power.* (A communication.) Dated July 21, 1856. (No. 1721.)

Compressed air is allowed to dilate while passing through the fuel in the furnace in a state of combustion, and then acts as a motive power by its pressure upon a piston. A quantity of steam proportionate to the burnt coke is also obtained by the heat given out by the air dilating in its passage through tubes forming the heating surface!

STATHAM, S., and E. O. W. WHITEHOUSE. *An improvement in the arrangements for, or working of, electric telegraphs.* Dated July 21, 1856. (No. 1726.)

This consists in the employment of one insulated wire as a return wire, common to, and used simultaneously in connexion with more than one telegraph instrument, in lieu of the earth circuit at present employed.

BING, J. *A new sauce boat or vessel for containing liquids of different densities.* Dated July 21, 1856. (No. 1727.)

A sauce boat or vessel is formed with a partition, for separating liquids of different densities.

BUTCHER, S. *Improvements in kitchen ranges.* Dated July 22, 1856. (No. 1735.)

Hot plates, which overlap the open fireplace, are used, and give to the range all the advantages of a close fire grate as respects its heating qualities, without interfering with the open chimney. The range is provided with ovens.

WEBSTER, W. *An improved steam and fire regulator.* (A communication.) Dated July 23, 1856. (No. 1743.)

A metallic flexible support is supplied to the diaphragms of steam and fire regulators to prevent them from bursting, and at the same time acts as a guiding support to the plunger and piston.

ELLISON, R. B. *Improvements in electric telegraph apparatus.* Dated July 23, 1856. (No. 1745.)

This relates—1. To improved coils. 2. To an improved manipulator for changing the direction of the currents. The improvements in coils consist in the substitution of a short coil round a piece or pieces of soft iron for the long coils usually made use of round the needle itself.

BAIN, A., and B. J. HEYWOOD. *Improved apparatus for supplying and drawing off liquids, and for stopping the flow of liquids and aëriform bodies.* Dated July 23, 1856. (No. 1747.)

This relates—1. To a substitute for the common tap or cock, consisting simply of a vulcanised India rubber tube provided with a rigid mouth-piece, and with a ring or contrivance for holding the mouth-piece while the tube is in a bent position. The tube when straight will permit air or water

to flow through it, and to stop the flow it is only necessary to double the tube back upon itself. 2. To the application of a floating tube to a cistern, reservoir, or river for drawing off water at variable levels above the turbid portion of the body of water and below the surface.

WEBSTER, J. *Improvements in distilling and treating rough turpentine and resinous matters.* Dated July 23, 1856. (No. 1750.)

Such substances are distilled, together with water, by heat aided by a vacuum, and, to obtain the resins remaining in the still as free from colour and water as may be, the water remaining is evaporated by heat and a vacuum.

DETOUCHE, C. L., and J. J. E. R. HOUDIN, jun. *Improvements in the application of clocks or time-keepers actuated by electricity, to street and other lamps.* Dated July 23, 1856. (No. 1751.)

The inventors describe an arrangement of electrical and other apparatus for the above purpose.

PRÉVÔT, P. C. *An improved railway break.* Dated July 23, 1856. (No. 1752.)

The inventor forms on the wheels notched or toothed flanges, and furnishes each wheel so fitted with a double pall or stop, which enters the teeth or notches when actuated so to do, by longitudinal rods.

PETSCHLER, H. C. F. M. *Improvements in obtaining and applying motive power, and in the machinery or apparatus connected therewith.* Dated July 24, 1856. (No. 1753.)

The inventor employs an inner spur wheel gearing into an outer rim which has teeth and spaces formed upon its inner surface, and each rotating upon its own centre, the whole being actuated by gravity!

PROVISIONAL PROTECTIONS.

Dated December 29, 1856.

3086. William Renwick Bowditch, clerk, of Wakefield, York. Improvements in the manufacture of a compound to be used as a varnish for water colours, and as a carrier for water colours or paints.

Dated January 19, 1857.

154. John Haswell, of Vienna, engineer. Improvements in the construction of railway carriages, which improvements are also applicable to locomotive steam engines.

Dated February 4, 1857.

322. Felix Moreau, of Paris, gentleman. Recovering the fatty matters from coom or dirty axle grease and lubricating oils, thereby rendering them fit to be used again.

Dated February 11, 1857.

399. Achille Constantin Dandraut, of Rue Neuve des Petits Champs, Paris. Preserving organised animal and vegetable matters, especially alimentary substances.

Dated February 12, 1857.

417. William Edward Newton, of Chancery-lane, civil engineer. Improved machinery for cutting metals or other hard substances. A communication.

Dated February 13, 1857.

422. Charles Crossley, Dan Leeming, and John Crossley, all of Halifax, York, machine makers. Improvements in apparatus for heating and in taps to be employed in combination therewith, which taps are also applicable for general purposes.

432. George Hardstaff, of Skegby Colliery, near Mansfield, engineer. Improvements in apparatus for actuating and applying the breaks of carriages used on railways and for coupling such carriages.

Dated February 19, 1857.

482. Lot Wilks, of Bedford-row, Middlesex, messenger. An apparatus for signalling between the guards and engine drivers of railway trains, which is also applicable to other similar purposes.

Dated February 20, 1857.

494. Henry Thomas Helyer, of Ryde, Isle of Wight, surveyor. Improvements in the construction of bridges and arched structures.

498. John Rowland Crook, of Birmingham, hat manufacturer. An improved material for, and an improvement in, the manufacture of hat tips, which material is also applicable to the manufacture of hat and other boxes or cases.

Dated February 23, 1857.

528. John Kirkham, of Tonbridge-place, New-road, Middlesex, civil engineer. Improvements in the construction of furnaces, ovens, or kilns, for drying, baking, or burning pottery or earthenware, bricks, tiles, or other similar articles, and in the means of collecting and condensing or carrying off the smoke, gases, or vapours evolved from such or other furnaces or fire-places, or that escape or arise from the retorts and other parts of the apparatus used in the manufacture of gas.

Dated February 25, 1857.

556. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in carding machines. A communication from E. Lhuillier, of Louviers, France, merchant.

558. James Spence, of Park-terrace, Brixton-road, Surrey. An improvement in the manufacture of artificial coral.

Dated February 26, 1857.

560. John Henry Glew, of Charlotte-street, St. Pancras, Middlesex, boot and shoe maker. An improved method of fastening ladies' and gentlemen's boots and shoes.

562. William Edward Wiley, of Birmingham, manufacturer. Improvements in ever-pointed pencil cases.

564. Joseph Hoy, sen., of Islington, Middlesex, stonemason. Improvements in apparatus for distributing sand on railway rails.

566. Charles Bruton, sen., Charles Bruton, jun., Francis James Bruton, and Samuel Rogers Bruton, of Manchester, ink manufacturers and stationers. An improved azure blue for domestic purposes.

568. William Mills, of Lower Craven-place, Kentish-town. An improvement in the action of upright pianofortes.

570. Victor Cassaignes, of Queen-street, Golden-square. Improvements in the manufacture of metallic pens and pen holders.

572. Nathaniel Jones Amies, of Manchester, smallware manufacturer. Certain improvements in machinery or apparatus for polishing and finishing yards or threads.

Dated February 27, 1857.

574. David Davies, of Wigmore-street, Cavendish-square, Middlesex, coachmaker. An improvement in steps for carriages.

576. William Wilkinson, of Nottingham, engineer. Improvements in lighting and in lamps.

580. James Richard Field, of Fore-street, Cripplegate, London, Julius Goodman and Louis Goodman, both of Great Prescott-street, Goodman's-fields, London. Certain improvements in trowsers.

582. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. An improvement in springs for railroad carriages and other uses. A communication.

Dated February 28, 1857.

584. Frederick Stubbin, of Bawtry, York, gentleman. Improvements in propelling vessels.

586. Anguish Honour Augustus Durant, of the Conservative Club, St. James's-street, Middlesex, esquire. Improvements in apparatus for ascertaining and indicating the number of, and distance travelled by, passengers in public carriages, and the fares paid.

588. Charles Weightman Harrison, of Woolwich, civil engineer. Improvements in obtaining light by electricity.

590. George Wilson, of Glasgow, manufacturer. Improvements in weaving.

592. Henry Whatley Tyler, of Norfolk-crescent, Hyde-park, captain Royal Engineers. Improvements in the permanent way of railways.

596. Henry Duncan Preston Cunningham, of Bury, Hants, esquire. An improvement in sails, and in the reefing and furling of sails, and setting and taking in of sails.

Dated March 2, 1857.

598. James Murphy, of Newport, Monmouth, civil engineer. Improvements in securing screw nuts on their bolts, and bolts in plates.

600. Charles James Parry and William Briddon, of Manchester, manufacturers. A certain improvement in the manufacture of shirt collars.

602. Frederick Decastro Jones, of Tavistock-street, Covent-garden. An improvement in the construction of the bits of horses. A communication.

604. Edwin Francis Jones, of Redcar, York, engineer. Improvements in the manufacturing of pig and bar iron.

606. Thomas Rose, jun., of Botany Bay Farm, Hilgay Fen, Norfolk, farmer. Improvements in apparatus for cutting or disintegrating vegetable substances.

608. Charles Pauvert, of Chatellerault, France, ecclesiastic. Certain improvements in manufacturing iron.

610. Charles Pauvert, of Chatellerault, France, ecclesiastic. Certain improvements in manufacturing steel and cast steel.

612. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. A method of constructing and heating buildings and apparatus for the winding of silk from the cocoon. A communication from F. Rignon, of Turin.

614. William Brown, of Gresham-street, London, merchant. An improved mode of preparing tapes for the market.

616. Thomas Gray, of Rose-lane, Stepney, ink manufacturer. Imrovements in separating vegetable fibres from mixed fabrics.

Dated March 3, 1857.

620. William Leuchars, of Piccadilly. Improvements in locks for travelling bags, portfolios, despatch boxes, and such like depositories.

622. Edward Lindner, of New York, U.S., engineer. Improvements in cartridges and bullets, together with an apparatus for producing the same.

624. William Edward Newton, of Chancery-lane, civil engineer. Improved means for preventing the forgery or imitation of bank notes, bills, certificates, cheques, bonds, deeds and other like articles. A communication.

626. William Edward Newton, of Chancery-lane, civil engineer. A preparation of materials for coating roofs or other portions of buildings to render them impervious to wet. A communication.

628. William Adam, of Glasgow, warehouseman, and John Stewart Templeton, of the same place, manufacturer. Improvements in weaving looped and pile fabrics.

Dated March 4, 1857.

631. Gerard Ralston, of Tokenhouse-yard, London, E.C. Improvements in fire-arms, and in balls or projectiles. A communication.

633. William Hartley and Thomas Hardman Farrar, of Bolton, Lancaster, machinists. Improvements in looms.

635. Henry Lawrence De Zeng, of Geneva, Ontario, New York, U. S. Improvements in marine and fog signals, for reefs and other locations.

637. John William Heinke, of Great Portland-street, engineer. An improved construction of diving bell.

Dated March 5, 1857.

639. George Walter Dyson, steel roller, of Tinsley, near Sheffield. Tilting iron and steel, or any other malleable substance, by perpendicular motion.

641. William Muir, of Glasgow, engineer. Improvements in generating steam for marine purposes.

643. Samuel Sutcliffe, of Manningham, near Bradford, York, cotton spinner, and James Stocks, of the same place, engine tenter. Improvements in means or apparatus in connection with steam boiler and other furnaces to facilitate the consumption of smoke therein.

645. Hugh Greaves, of New Palace-yard, Westminster, civil engineer. Improvements in the mode of coupling or connecting pipes, columns, and conduits, in the machinery for manufacturing the hoops to be used in connecting such pipes and columns, and in the shape of such pipes, columns, and conduits, whereby they become adapted for the support and conveyance of vehicles.

649. George Bower, of St. Neots, Huntingdon, gas engineer. Improvements in apparatus for manufacturing gas.

651. William Travis, of Crompton, Lancaster, carder. Improvements in furnaces.

653. James Kinder Cheetham, of Rochdale, Lancaster, doctor of medicine, and Thomas Southworth, of the same place, gentleman. Improvements in the use or application of certain substances for sizeing or finishing yarn or thread, also applicable for sizeing or stiffening woven and other fabrics.

655. Richard Atkinson Coward, of Laurence Pountney-lane, London. Improvements in screw or submerged propellers. A communication.

Dated March 6, 1857.

657. Francis Alton Calvert, of Manchester, engineer. Improvements in machinery for ginning cotton and for cleaning and carding cotton and other fibrous materials.

659. Luke Barton, of Ison Green, near Nottingham, machinist, and Edwin Stanley Brooks, of Nottingham, hosier. Improvements in the manufacture of knitted fabrics.

661. William Petrie, of Woolwich, civil engineer. Improved means of and apparatuses for creating or increasing draughts and currents.

Dated March 7, 1857.

663. Rowland Mason Ordish, of St. Mark's-cres-

cent, Regent's-park. Improvements in suspension bridges.

665. Josiah Parkes, of Great College-street, Westminster, civil engineer. An improved apparatus for locomotive purposes.

667. Charles Lungley, of Deptford-green Dockyard, ship builder. An improved mode of constructing dry docks and basins for the stowage of ships.

669. Georges Antoine Tabourin, of Lyons, France. An improved rotative engine.

Dated March 9, 1857.

675. Clement Sharp, of Birmingham, gentleman. A new or improved manufacture of ships' thimbles and other metallic fittings used for rigging and sails and rope gearing in general.

679. George Davies, of Serle-street, Lincoln's-inn, civil engineer. An improved self-inking stamp for printing cards, labels, and other articles. A communication from W. H. Elliot, of Plattsburgh, New York.

681. Samuel Faulkner, of Manchester, cotton spinner. Certain improvements in machinery or apparatus for carding cotton and other fibrous substances.

683. Henry Richard Smith, engineer and machinist, of Wellingborough, Northamptonshire. Certain improvements in manufacturing and purifying gas made from coal or other bituminous substances for illumination.

685. Charles Colton Dennett, of Nottingham, builder. A new construction of floors and ceilings of buildings.

687. William Edward Newton, of Chancery-lane, civil engineer. Improved machinery for cutting screw threads. A communication.

689. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. An improved construction of rudder. A communication.

691. Andrew Knox, of Mile End, Middlesex, and Thomas Robson, of Aldersgate-street, London, engineers. An improved gas regulator.

693. William Charles Theodore Schaeffer, of Stanningley, near Leeds. Improvements in treating the waste waters of woollen and other mills.

695. James Edward Duyck, of West Farleigh, Kent, gentleman. An improvement in treating cotton seed, in order to extract color from the oil obtained therefrom.

Dated March 10, 1857.

697. Johannes Neuenschwander, of Albion-wharf, Kensington-basin, Kensington. Improvements in the process of preserving milk.

699. Charles Reynaud, of Lyons, France, upholsterer. Improvements in the application of India rubber springs to mattresses, sofas, chairs, and other cushions or articles of furniture. Partly a communication.

701. Charles Baylis, of the Poultry, London, solicitor. An improved method of constructing and arranging roads and ways particularly applicable to populous cities and crowded thoroughfares.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

735. William Pidding, of New Kent-road, Surrey, gentleman. Improvements in machinery or apparatus for the manufacture of piled fabrics, whether plain or figured. Dated 16th day of March, 1857.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," March 24th,* 1857.)

2675. A. Hutton. An improved warming apparatus applicable to railway and road carriages and other useful purposes.

2676. T. S. Holt, E. Earnshaw, and J. Barlow. Improvements in certain parts of steam engines, steam boilers, and apparatus connected therewith.

2704. A. Barclay. Improvements in the manufacture of iron.

2713. A. M. J. Eeckman. A mechanical bakery and cookery.

2715. C. Michel and I. A. Maret. Making atmospherical observations.

2719. J. Wilson. Improvements in springs for railway and other carriages.

2721. S. C. Lister. Improvements in spinning.

2724. S. Dyer. Improved mechanism applicable to propelling ships and vessels, applicable also as power machinery for ships' purposes.

2732. J. Lord. An improved admixture or compound to be employed as a substitute for oil in the treatment of animal wool preparatory to carding.

2743. J. M. Gilbert. Improvements in certain machines for etching or engraving.

2745. P. A. L. de Fontainemoreau. Improved apparatus for preparing carbonic acid gas, and impregnating liquids therewith. A communication.

2775. R. A. Brooman. Improvements in the manufacture of artificial wines, or beverages to be substituted for wines, and in apparatus for aiding fermentation. A communication.

2795. J. Palmer. Improved means for separating different kinds or qualities of seed or grain from each other.

2802. F. N. Clerk. Improvements in metallic roofing for buildings and in appendages to roofs.

2816. C. A. Tissot. Improvements in the production of motive power, and in the apparatus connected therewith.

2817. A. Cellier. An improved mucilage applicable to the sizing and printing of textile materials.

2819. H. T. Sourbuts. Improvements in taps or valves, part of which are applicable to lubricators for steam engines and other purposes.

2852. R. A. Brooman. A chemical composition or agent to be employed in the dyeing of wools or woolens. A communication.

2858. M. Townsend. Improvements in machinery for the manufacture of knitted fabrics.

2874. J. Apperly and W. Clissold. Improved machinery for preparing fibrous substances for spinning.

2947. W. C. Cambridge. An improved construction of portable railway.

3086. W. R. Bowditch. Improvements in the manufacture of a compound to be used as a varnish for water colours, and as a carrier for water colours or paints.

32. R. A. Brooman. Improvements in winding, twisting, and doubling fibrous materials, in the machinery employed therein, and in the mode of driving the same, parts of which improvements are applicable to the communicating of rotary motion to other machinery. A communication.

382. J. Graham, J. Shepherd, and T. Whitaker. Certain improvements in power looms for weaving.

474. R. Best. An improvement or improvements in illumination.

478. J. Moule. Improved apparatus to be used for burning pyrotechnic compositions or preparations for producing artificial lights of various colours.

491. H. Y. D. Scott. An improved manufacture of cement.

492. P. Cato and J. Betteley. Improvements in

the masts, yards, and spars for ships or sailing vessels.

496. J. Grist. Improvements in mash tuns, and in apparatus to be employed therewith, which apparatus is also applicable to the heating and keeping up of a continuous circulation of liquids in any vessel to which it may be connected.

525. F. C. La Croix. An improvement in reducing and reefing the topsails of vessels.

541. A. Parkes. Improvements in separating tin from tin-plate scrap, and tin or zinc from other surfaces of iron.

571. W. Macfarlane. Improvements in moulding or manufacturing cast-iron pipes.

574. D. Davies. An improvement in steps for carriages.

582. A. V. Newton. An improvement in springs for railroad carriages and other uses. A communication.

588. C. W. Harrison. Improvements in obtaining light by electricity.

590. G. Wilson. Improvements in weaving.

596. H. D. P. Cunningham. An improvement in sails, and in the reefing and furling of sails, and setting and taking in of sails.

604. E. F. Jones. Improvements in the manufacturing of pig and bar iron.

608. C. Pauvert. Certain improvements in manufacturing iron.

610. C. Pauvert. Certain improvements in manufacturing steel and cast steel.

624. W. E. Newton. Improved means for preventing the forgery or imitation of bank-notes, bills, certificates, cheques, bonds, deeds, and other like articles. A communication.

649. G. Bower. Improvements in apparatus for manufacturing gas.

663. R. M. Ordish. Improvements in suspension bridges.

665. J. Parkes. An improved apparatus for locomotive purposes.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

640. Alexander Hendry.
646. John Hick.
649. Perceval Moses Parsons.
658. Claude Adrien Bernard Chenot.
667. James Hansor.
668. John Polson.
689. Stephen Holman.
695. John Jeys.
702. Thomas John Smith and Joseph Smith.
791. Charles de Bergue.

LIST OF SEALED PATENTS.

Sealed March 12, 1857.

2999. George Miller Clarke.
23. Nicolaus Charles Szerelmey.
180. Thomas Kitelee.

Sealed March 20, 1857.

2227. Francis Wrigley.
2233. Andrew Barrie.
2237. Peter William Barlow.
2295. James Begg.
2305. Edwin Hardon and Joseph Henry.
2327. Alexis Picard.
2352. Francis Whitehead.
2371. Lewis Jacob Jordan.
2397. Giovanni Battista Piatti.
2403. Richard Archibald Brooman.
2413. George Haseldine.
2481. Frederick Walton.
2515. Benjamin Ferrey.
2605. William Seed and William Ryder.
2701. Henry Hawes Fox.
2727. William Brindley.
2863. Philipp Kürten.
72. John James Russell and Joseph Bennett Howell.
111. François Auguste Verdeil and Emond Michel.
247. George Cranstoun Trotter Cranstoun, George Young, and John Lovell.

Sealed March 24, 1857.

2254. Claude Langlois.
2259. George Gower Woodward.
2263. George Neall.
2269. Joseph Edwards.
2275. James Noble Ward.
2277. Matthew Hickson.
2279. Robert Morrison.
2292. George Flint, Thomas Wood, and Edward Wood.
2320. David Ogilvy Boyd.
2334. Herbert Mackworth.
2384. William Caswell Watson.
2385. Anton Bruno Seithen.
2429. William Jeffrey.
2444. Isidore Delcambre.
2494. Leonard Alexander Desachy.
2520. James Fenton.
2552. Henry Holcroft.
2923. Hector Mottet.
2939. Richard Emery.
2978. William Frederick Thomas.
124. Charles Wye Williams.
153. Thomas Sagar and Christopher Turner.
211. Pier Alberto Balestrini.
257. George Fergusson Wilson.
295. Astley Paston Price.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subjects of Design.
Feb. 25	3949	S. Whitehall	Nottingham	Anti-garotte cravat.
26	3950	T. Patstone	Birmingham	Gas shade and regulator.
,,	3951	R. L. Howard	Whitecross-street	High-pressure ball cock.
27	3952	J. Underwood	Birmingham	Clasp.
28	3953	N. Hill, Son, & White	Coventry	Watch escapement.
Mar. 3	3954	R. Marples	Sheffield	Carpenter's brace with octagon lever pad.
10	3955	J. J. Stone	London	Crystal lamp.
14	3956	J. Coulson and Co	Grantham	Smut and chaffing machine.
20	3957	W. Leigh	Old Kent-road	Shirt collar.
21	3958	Moran and Quin	Poland-street	Stereoscope.
23	3959	G. Bayley	Upper Thames-street	Waterproof cap and life buoy.

PROVISIONAL REGISTRATIONS.

Feb. 27	851	T. Hargraves	Leamington	Fastening for petticoats.
Mar. 3	852	S. R. English	Birmingham	Skeleton lever corkscrew.
,,	853	E. Edwards	Cambridge	Photographic tent.
4	854	W. Johnston	Gloucester	Monumental tablet.
6	855	E. Waterman	London-wall	Book file.
7	856	R. K. Aitchison	Adam-street, Adelphi	Hot water jug.
12	857	M. A. Soul	Tabernacle-walk	Toilet soap dish.
,,	858	W. Leigh	Old Kent-road	Shirt collar.
13	859	H. Levy	Sheffield	Bottle corker.
17	860	A. Martin	Wareham, Dorset	Equitone valve for musical instruments.
18	861	J. W. Wilson	Banbury	Sides, ends, or bottoms, of boxes.
21	862	W. Blain & J. Chappel	Bolton, Lancaster	Chimney top.
,,	863	G. E. Oldham	New Quebec-street	Sans-pareil shirt

NOTICES TO CORRESPONDENTS.

A Working Mechanic.—By heating the iron to about a red heat, and rubbing it over with prussiate of potash, the desired effect will be obtained.

P.—We will endeavour to obtain for you the information you seek.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1756.] SATURDAY, APRIL 4, 1857. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

AUSTEN'S MACHINE FOR TESTING THE FORCE OF GUNPOWDER.

Fig. 1.

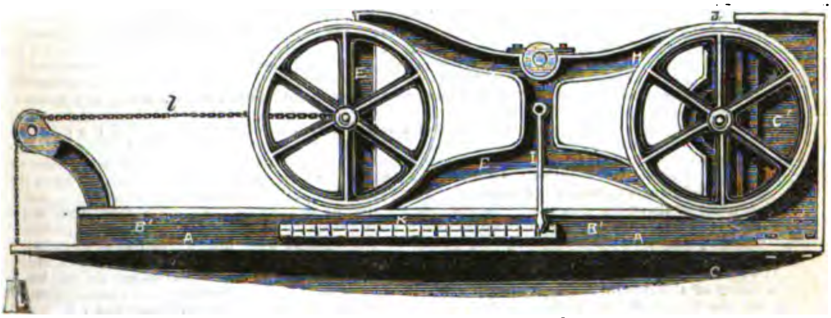


Fig. 2.

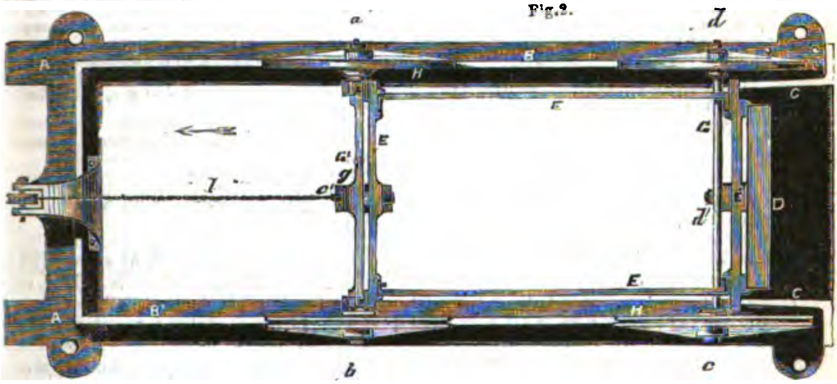


Fig. 3.

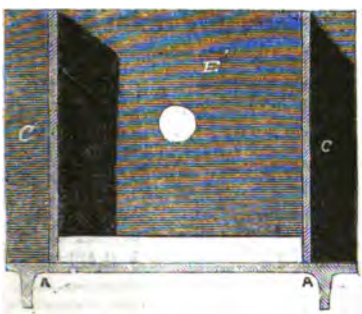
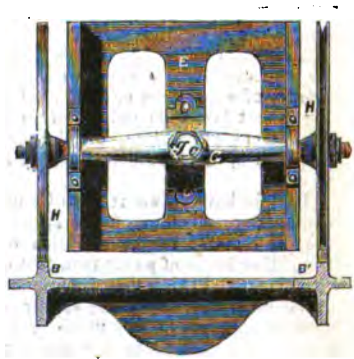


Fig. 4.



AUSTEN'S MACHINE FOR TESTING THE FORCE OF GUNPOWDER.

Mr. T. Austen, of Waltham Abbey, has patented a machine, which he calls "The Recoiling Target," for ascertaining the propelling force of different gunpowders. The following is Mr. Austen's own description of his machine, and is illustrated by the engravings on the preceding page:—

Fig. 1 represents a side elevation of the machine; fig. 2 is a top plan view thereof; fig. 3 a transverse and vertical section of the machine as it would appear if divided through the line, *c d*, figs. 1 and 2, looking in the direction of the arrow's flight; fig. 4 is a transverse and vertical section through the line *a b*, looking in the opposite direction. A A is a casting having projecting flanges or rails, B B'; C C are castings, securely bolted to the casting, A A, to prevent the particles of lead flying off from the face of the target when fired from the rifle. On the sides of the front wheels is a light framework, E E, of iron, to the end, E', whereof the solid metal target, D, is securely fixed by a pin and screw nut, *d'*. G is an axle (which moves on a centre pin, *c'*, thereby producing an equal pressure of the wheels, H H, on the rails, B B', although one of the said rails, B B', be out of the level of the opposite one). H H are light running wheels, mounted and revolving upon the ends of the axles, G G', which should be truly formed, and fitted so as to have as little friction as possible. It will be seen, on referring to figs. 2 and 4 that the edge of the rail, B, is formed flat, as also the peripheries of those wheels which run thereon, and that the rail, B', is formed with a V-shaped edge, as also the peripheries of those wheels which run thereon, the intention for thus forming the said rails and wheels, B' B', and H H being to direct and guide the said wheels in their proper course during the movement of the recoiling target, D, connected therewith; I, is an index hand, securely fixed to one side of the moveable framework, E, E; and K is a plate, with divisions marked thereon, representing inches or parts of inches, or other conventional marks, indicative of the force of the powder; L is a weight, connected by a small chain, *l*, to the framework or other part of the target, the said weight being employed to counteract the friction of the running wheels upon their respective rails, so as to render the action of the machine as delicate as possible.

The mode of operating with the above machine for proving or ascertaining the propelling force of gunpowder, is as follows:—The patentee takes from 1 to 2½ drachms of the gunpowder which it is desired to prove, and places it in the barrel of a rifle, in which he also places upon the powder one of Joyce's thick elastic felt waddings, and then a lead ball weighing about an ounce. It must here be remarked that these felt waddings effectually prevent any escape of the propelling force of the powder before the ball has left the barrel of the rifle, and thus ensure the whole force of the powder acting upon the ball. Now, supposing the target, D, and parts to which it is connected, to be in the position exhibited, he fires at the distance of ten yards, measuring from the mouth of the barrel and the face of the target; the effect will be to propel the machine along the rails, B and B', a distance proportionate to the strength of the powder, the distance so moved being indicated by the index hand, I, upon the graduated plate, K.

"I have fully and satisfactorily proved," says Mr. Austen, "the accuracy of the machine by the momentum of falling bodies acting on the face of the recoiling target, and I also have found 1 drachm of the first class sporting powder fired from a rifle at 10 yards distance from the target propelled an ounce lead ball on to the face of the target at a velocity of 1,180 feet per second."

ON THE CONSERVATION OF FORCE.

By Professor Faraday, D.C.L., F.R.S.

(Concluded from page 295.)

It will not be imagined for a moment that I am opposed to what may be called the *law of gravitating action*, that is, the law by which all the known effects of gravity are governed; what I am considering is, the definition of the *force* of gravitation. That the result of one exercise of a power may be inversely as the square of the distance, I believe and admit; and I know that it is so in the case of gravity, and has been verified to an extent that could hardly have been within the conception even of Newton himself when he gave utterance to the law: but that the *totality* of a force can be employed according to that law, I do not believe, either in relation to gravitation, or electricity, or magnetism, or any other supposed form of power.

I might have drawn reasons for urging a continual recollection of, and reference to, the principle of the conservation of force from other forms of power than that of gravitation; but I think that when founded on gravitating phenomena, they appear in their greatest simplicity; and precisely for this reason, that gravitation has not yet been connected by any degree of convertibility with the other forms of force. If I refer for a few minutes to these other forms, it is only to point, in their variations, to the proofs of the value of the principle laid down, the consistency of the known phenomena with it, and the suggestions of research and discovery which arise from it.* *Heat*, for instance, is a mighty form of power, and its effects have been greatly developed; therefore, assumptions regarding its nature become useful and necessary, and philosophers try to define it. The most probable assumption is, that it is a motion of the particles of matter; but a view, at one time very popular, is, that it consists of a particular fluid of heat. Whether it be viewed in one way or the other, the principle of conservation is admitted, I believe, with all its force. When transferred from one portion to another portion of like matter, the full amount of heat appears. When

* Helmholtz, "On the Conservation of Force." "Taylor's Scientific Memoirs," 2nd Series, 1853, p. 114.

transferred to matter of another kind, an apparent excess or deficiency often results; the word "capacity" is then introduced, which, whilst it acknowledges the principle of conservation, leaves space for research. When employed in changing the state of bodies, the appearance and disappearance of the heat is provided for consistently by the assumption of enlarged or diminished motion, or else space is left by the term "capacity" for the partial views which remain to be developed. When converted into mechanical force, in the steam or air engine, and so brought into direct contact with gravity, being then easily placed in relation to it, still the conservation of force is fully respected and wonderfully sustained. The constant amount of heat developed in the whole of a voltaic current described by M. P. A. Favre,* and the present state of the knowledge of thermo-electricity, are again fine partial or subordinate illustrations of the principle of conservation. Even when rendered radiant, and for the time giving no trace or signs of ordinary heat action, the assumptions regarding its nature have provided for the belief in the conservation of force, by admitting, either that it throws the ether into an equivalent state, in sustaining which for the time the power is engaged; or else, that the motion of the particles of heat is employed altogether in their own transit from place to place.

It is true that heat often becomes evident or insensible in a manner unknown to us; and we have a right to ask what is happening when the heat disappears in one part, as of the thermo-voltaic current, and appears in another; or when it enlarges or changes the state of bodies; or what would happen, if the heat being presented, such changes were purposely opposed. We have a right to ask these questions, but not to ignore or deny the conservation of force; and one of the highest uses of the principle is to suggest such inquiries. Explications of similar points are continually produced, and will be most abundant from the hands of those who, not desiring to ease their labour by forgetting the principle, are ready to admit it either tacitly, or, better still, effectively, being then continually guided by it. Such philosophers believe that heat must do its equivalent of work; that if in doing work it seem to disappear, it is still producing its equivalent effect, though often in a manner partially or totally unknown; and that if it give rise to another form of force (as we imperfectly express it), that force is equivalent in power to the heat which has disappeared.

What is called *chemical attraction* affords equally instructive and suggestive considerations in relation to the principle of the conservation of force. The indestructibility of individual matter is one case, and a most important one, of the conservation of chemical force. A molecule has been endowed with powers which give rise in it to various qualities, and these never change, either in their nature or amount. A particle of oxygen is ever a particle of oxygen—nothing can in the least wear it. If it enters into combination and disappears as oxygen; if it pass through a thousand combinations, animal, vegetable, mineral; if it lie hid for a thousand years and then be evolved, it is oxygen with its first qualities, neither more nor less. It has all its original force, and only that. The amount of force which it disengaged, when hiding itself, has again to be employed in a reverse direction when it is set at liberty; and if hereafter we should decompose oxygen, and find it compounded of other particles, we should only increase the strength of the proof of the conservation of force, for we should have a right to say of these particles, long as they have been hidden, all that we could say of the oxygen itself.

Again, the body of facts included in the theory of definite proportions, witnesses to the truth of the conservation of force; and though we know little of the cause of the change of properties of the acting and produced bodies, or how the forces of the former are hid amongst those of the latter, we do not for an instant doubt the conservation, but are moved to look for the manner in which the forces are for the time disposed of, or if they have taken up another form of force, to search what that form may be.

Even chemical action at a distance, which is in such antithetical contrast with the ordinary exertion of chemical affinity, since it can produce effects miles away from the particles on which they depend, and which are effectual only by forces acting at insensible distances, still proves the same thing, the conservation of force. Preparations can be made for a chemical action in the simple voltaic circuit, but until the circuit be complete that action does not occur; yet in completing we can so arrange the circuit that a distant chemical action, the perfect equivalent of the dominant chemical action, shall be produced; and this result, whilst it establishes the electro-chemical equivalent of power, establishes the principle of the conservation of force also, and at the same time suggests many collateral inquiries which have yet to be made and answered before all that concerns the conservation in this case can be understood.

This and other instances of chemical

* "Comptes Rendus," 1854, vol. xxxix., p. 1212.

or creation of force without clear and constant proof. Just as the chemist owes all the perfection of his science to his dependence on the certainty of gravitation applied by the balance, so may the physical philosopher expect to find the greatest security and the utmost aid in the principle of the conservation of force. All that we have that is good and safe, as the steam engine, the electric telegraph, &c., witness to that principle,—it would require a perpetual motion, a fire without heat, heat without a source, action without reaction, cause without effect, or effect without a cause, to displace it from its ranks as a law of nature.

RAISING THE SUNKEN SHIPS AT SEBASTOPOL.

(*Condensed from the "Builder."*)

From an American source, we learn some particulars of the contract entered into with Mr. J. E. Gowen, of Boston, U.S., for raising the sixty-four vessels of war sunk at Sebastopol during the war. During a long examination made in his submarine armour, Mr. Gowen discovered that the channel of the harbour was in the middle, with a sand bank on the north, and a mud bank on the south side of it; in the latter only worms were found, but were there plentiful. But few vessels, however, were exposed to their attacks. The machinery was carefully covered with a preparation of tallow to protect it. The value of the whole fleet is 65,000,000 dollars, and a certain portion of the value of each ship raised is to be handed to Mr. Gowen at the moment it is restored to the Russian government. The American expedition will consist of two vessels, one of which leaves Philadelphia on or about the first of April. The number of persons engaged to accompany it is about 150. Some of the hydraulic machinery for raising the vessel is of a colossal description, one cylinder alone weighing 64,000 pounds. The value of the material to be furnished by the Russian government, to be used in the raising of the fleet, will be about 1,500,000 dollars; and the time occupied in performing the contract will, it is thought, be about eighteen months or two years. At Kertch, there are also some five or six Russians vessels sunk, which are included in the contract, and in the harbour of Sebastopol, there are some 600,000 dollars worth of chains and anchors. In addition to the expedition from America, the Russian government bind themselves to furnish from 3,000 to 5,000 men, whose pay from Mr. Gowen will be about 25 cents. per day, they "finding" themselves.

EXHIBITION OF INVENTIONS AT THE SOCIETY OF ARTS.

The ninth annual exhibition of inventions, in connection with the Society of Arts, John-street, Adelphi, London, was opened on Monday, the 23rd of March, and will continue open every day until the 23rd of May next. Although most of the inventions exhibited have been described in our pages, there are others which have not been brought to the notice of our readers, and we will therefore give a detailed account of the chief articles exhibited, numbering them in the order in which they stand in the Catalogue, and adopting the statements of the exhibitors in those cases in which we know them to be accurate, but in those alone.

1. *Patent regulating Air-door for Furnaces;* J. H. Stevens, Fish-street-hill, London.

This consists of an inner perforated hemispherical compartment, an external door-plate, and an adjusting plate on the back of the latter; these plates are so perforated, that, by turning a handle, the apertures in each can be brought opposite each other, either wholly or partially, as the supply of air is to be increased or diminished.

2. *Patent Self-acting Apparatus for Preventing the Formation of Smoke in any description of Closed Furnaces;* Fernihough and Farrow, Dukinfield, near Manchester.

The object of the inventors in the construction of this apparatus, which consists of valves, vertical bars, &c., has been to render it cheap, self-acting, independent of any attention on the part of the fireman, and applicable to all closed furnaces. Closely-set vertical bars at the back of the door are used to shield the valves in the front from the action of the fire, and divide the air into thin streams. The mode of adjusting the valves is as follows:—The fire burns down until no more combustible gases are given off, and the valve weights are then adjusted so as to allow the valves to close of themselves. Upon the introduction of a fresh charge of coals, the valves are said to open just in proportion to the amount of combustible gases generated, and resume their closed position as soon as the fire has burned down. This action is caused partly by the chemical affinity that exists between highly-heated hydrogen, &c., and oxygen, and partly by the additional draught created by converting the combustible gases into flame instead of smoke.

3. *Gray's Patent Air-channel Furnace Bars.* Exhibited by W. Day and Co., Bow-road.

The engraving illustrates the new bar. It is intersected by a series of diagonal air channels, always grooved towards the back of the furnace, so as not to impede a free current of air; while the channels are made much wider below than on the upper surface, to increase the area for the passage of air. The lower channels of the bar form inclined planes to allow dust and ashes to escape.

The diagonal position of the channels allows of a rake being passed over the bars, to arrange the fire, or to rake out clinkers or ashes, while the flat spaces between support the fuel. A large additional area for the entrance of air is obtained, and

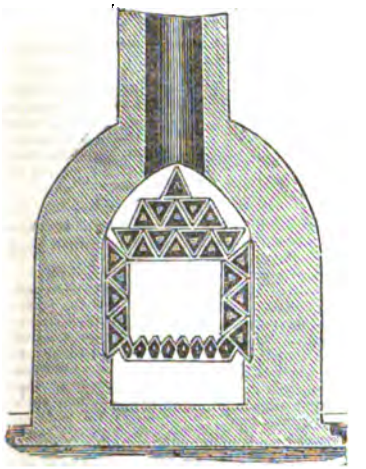
the combustion thereby rendered more perfect. "The owners of four forty-horse boilers, in order to test minutely the difference between the old and the new bars, instructed," say the exhibitors, "their engineer to apply the counting-machine to the engines, when the recorded revolutions were as follows:—

	Revolutions.	Cwt. Fuel.	Revolutions per cwt.
Old thin bars	121,674	465	261
Air-channel bars	162,976	502	324

The result shows a difference of 63 more revolutions for every cwt. of fuel used with the patent bars."

4. *Patent Triangular Tubular Boiler;* T. G. Messenger, Loughborough.

In this boiler an arrangement of parallel triangular tubes is used, as shown in the engraving. The horizontal position of the tubes, and the triangular shape, cause the gases in their upward current to rebound from tube to tube, so that before they can reach the flue, the whole of the heat is expended



in the boiler. Rapid circulation of the water is caused by the action and re-action of the fire. Should the boiler require cleaning, it can be done by removing the ends which are made in separate parts. The fire-bars form water-spaces.

5. *Patent Retort Boiler;* Dunn, Hattersley, and Co., Manchester.

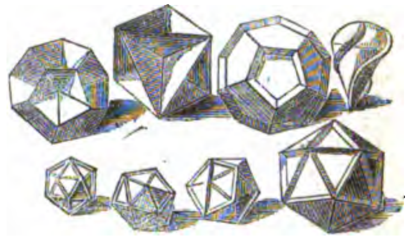
See *Mechanics' Magazine*, vol. lxiv., No. 1704, page 313.

6. *Combined External and Internal Furnace Steam Boiler;* D. Auld and J. Stephen.

This boiler is of the stationary kind, as used for general factory purposes. It has been devised with the view of being worked with both external and internal furnaces and flues in combination. The lower furnace is fed from a pit beneath the staging or platform upon which the fireman stands in feeding the upper one.

7. *Patent Automatic Scavengers, for keeping Steam Boilers free from Mud deposit, or Scale;* J. W. Duncan, 24, Grove-end-road, St. John's-wood.

These articles, which are of metal, are put into the boiler with the water, where they sink to the bottom; but when ebullition takes place, the steam, in rising, fills the cavities in the lower sides of some of the scavengers and lifts them up; it also produces a rotary motion in those furnished with spirals, which are of less specific gravity than the water under steam pressure, and causes them to move about and act upon the sides and bottom of the boiler, their action clearing off the scale or mud



deposit. Their motion is found to equalize the temperature, preventing in a great degree the formation of large bubbles, which produce priming.

8. *Lapham's Patent Self-acting Water Regulator for Steam Boilers.* Exhibited by W. Day and Co., Campbell-road, Bow-road.

See *Mechanics' Magazine*, current vol., No. 1752, page 220.

9. *Patent Gauges;* Gwynne and Co., Essex-wharf, Essex-street, Strand.

In these gauges, which are now extensively used for indicating the pressure of steam, gas, water, and other fluids, for sounding at sea, and for ascertaining the amount of vacuum in condensers, &c.,

the pressure acts upon a piston, working without friction; the piston is attached to a lever, and gives motion to the indicating hand by a rack and pinion; a spring attached to the lever regulates the motion of the hand. Their action is equally precise, whether close to or at a distance from the boiler, &c.

10. *Patent Steam Gauge;* Chadburn, Brothers, Sheffield.

See *Mechanics' Magazine*, vol. lxv., No. 1742, page page 607.

11. *Patent Water Gauge;* Chadburn, Brothers, Sheffield.

See No. 10.

12. *Apparatus for Measuring the Speed of Currents of Air and Water, and Indicating the Speed of Ships.*

The apparatus consists of a double conical tube. At the part where the tubes are joined together, is fixed a small tube at right angles to the centre line of the cones. When a current of water or air is passing through the cones, it causes a sucking action, or negative pressure, to take place in the small tube, which, being attached to an indicating apparatus or meter, will show at once the velocity of the current of air or water.

13. *Hopkinson's Improved Steam Engine Indicator for High and Low Pressure.*

This is the first of several very useful articles, exhibited by Mr. A. P. How, of 81, Mark-lane. In this indicator the revolving cylinder is not detached from the other portions of the instrument, as in those generally made, but is placed round the barrel of the indicator, being in that place more convenient and firm for the operation which has to be performed upon it. The instrument has all the working parts truly and accurately fitted, so as to produce true and steady motion, with the least possible friction.

14. *A Direct-Acting Pendulous Steam Engine;* Thomas Hitt, 33, Southampton-street, Strand.

See *Mechanics' Magazine*, vol. lxv., No. 1717, page 1.

15. *Metallic Packing for Stuffing Boxes and Pistons.*

This packing consists of a series of metallic rings, between which are placed steel plate springs, which serve to press the metallic rings tight against the rod or cylinder.

16. *Geared Trunk Marine Engines;* Messrs. Tulloch and Denny.

These engines are fitted in the steam ships *Cottingham* and *Empress*. They are peculiar, in so far as they are of the trunk class, fitted with spur gearing for driving the screw propeller.

17. *Patent Improved Paddle Wheels;* C. P. Sharpley, Berry's Cottage, Chapel-street, Stockwell.

The paddle wheel is a continuous annular spiral paddle, or, in other words, an endless spiral float, fixed to the frame so that the plate of which it is composed shall always enter and leave the water edge foremost.

18. *Improvements in Screw Propulsion;* Exhibited by T. Hitt, 33, Southampton-street, Strand.

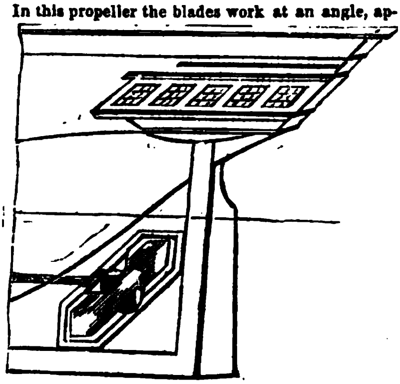
In this system of propelling, two screws are placed at an angle of (say) forty-five degrees, the right screw rotating towards the left, and the left towards the right.

19. *Knuckle-jointed Screw Propeller;* William Lynn, Assistant Inspector of Steam Machinery, H. M. Dockyard, Portsmouth.

See *Mechanics' Magazine*, vol. lxv., No. 1730, page 316.

20. *Patent Oblique-Action Propellers;* J. W. Duncan, 24, Grove-end-road, St. John's-wood.

In this propeller the blades work at an angle, approaching forty-five degrees to the water line of the vessel. This arrangement is to admit of the use of screws of a diameter nearly one-third greater than is applicable according to plans heretofore adopted. A second screw may be fitted at the bows of a vessel (in the cut water).



21. *Engine Room Telegraph;* A. P. How, 81, Mark-lane.

This telegraph is designed for communicating directly between the captain and engineer. It is worked from the bridge, where a column carries a dial, on which are engraved the necessary signals. There is a corresponding dial in the engine-room, and the communication is by a spindle and tooth wheels. The captain wishing the vessel to go "a-head," moves a handle on the top dial until he brings it directly over the word "a-head" on the dial. In this action a gong is sounded in the engine-room, and the engineer's attention is thus directed to the dial, which, being cased in, exhibits only one signal at a time: the possibility of accident is thus prevented.

22. *Engine Room Telegraph, with Illuminated Dial;* A. P. How, 81, Mark-lane.

In these telegraphs, as now constructed, an important improvement has been effected, namely, the top part of the column on the bridge has been enlarged, so as to admit of a lamp being fitted internally, which exhibits the signals clearly at night, the dial being now made partly of ground glass with the words painted thereon in addition to their being engraved on the brass of the dial.

23. *The Helmsman's Telegraph;* J. and A. Ridsdale, 54, Minories.

This invention is intended to effect a speedy and efficient communication from the officer in command of steam or other vessels, to the helmsman or quartermaster. To the three handles are attached three coloured discs for the day signals, and for the night signals, three lanterns, with corresponding colours, working in the interior of the telegraph. By moving either of these handles as may be required, instantaneous orders or signals can be given. A small hand lantern, with corresponding colours, is used by the officer or quartermaster at night, as proof that the signals have been duly observed.

24. *Model of the Screw Steamship "Torino;"* exhibited by A. P. How, 81, Mark-lane.

This model is to the scale of one-eighth of an inch to the foot. The vessel is 265 feet between the perpendiculars, 38 feet broad, with a depth of hold of 28 feet, and draws, when loaded, 20 feet. She is three-masted and barque-rigged, the whole of the standing rigging being wire-rope, and has a poop deck and raised forecastle, with engines of 300 horse power nominal, by Messrs. Maudslay, Sons, and Field, direct acting, horizontal, and with tubular boilers. The diameter of the screw propeller is 16 feet, and the pitch 19 feet 6 inches. She has How's mechanical telegraph for communicating between the captain and engineer, and improved engine-room fittings. The vessel is the property of the Genoa Transatlantic Steam Company, recently established to form a regular line of communication between Genoa, the United States, and South America.

25. *Model of the New Royal Yacht.* Exhibited by A. P. How, 81, Mark-lane.

This model is to the scale of one-sixteenth of an inch to a foot. The vessel was designed and built at H. M. Dockyard, and has oscillating engines by Messrs. J. Penn and Son, of Greenwich.

26. *Ships' Rudder;* John Holman, Topsham. Exhibited by F. Walker, 173, Fenchurch-street.

In this rudder the braces and pintles usually employed are dispensed with.

27. *Improvements in Shipbuilding;* P. De Fontainemoreau, South-street, Finsbury.

A peculiar mode of constructing keels of vessels is used: and the hulls of vessels are formed and strengthened by means of iron brace pieces, and by an improved method of uniting and fitting the ribs together.

28. *Patent Improvements in Working and Protecting the Sails of Ships, &c.;* Samuel Dyer, Bristol.

A hollow or tubular yard is used with an opening to allow the sail to pass into it, to be wound upon a roller, by the aid of pulleys worked on deck.

29. *Patent Improvements in Reefing, Furling, and Setting the Sails of Ships, &c.;* Samuel Dyer, Bristol.

This invention consists in the adoption of certain appliances for effecting these objects from the deck of the vessel.

30. *Patent Marine Cement, for Preventing the Inside Corrosion of Iron Ships;* Westwood and Baillie.

This specimen of the cement is applied to one side of a small piece of iron, the other side of the iron being left uncoated. It is then put into a small jar, and partly immersed in water containing a solution of loaf sugar and common salt, to produce acids without discolouring the water when first put in. Every iron ship carrying cargoes of sugar or salt has the same acids, and often other acids from guano, cattle urine, coal dust, &c., which mix with the bilge water in contact with the metal, when a chemical and destroying action ensues, even where the bilge plates and rivets are painted over about once a year. The action of the acids in the jar on the uncoated surface of the iron gives off oxide of iron, which may be seen by the rusty colour of the water, and in hot weather by an effervescence on the metal, whereas on the side coated with the cement the acids are proved to be harmless, and the surface may be cleaned like enamel. This cement supersedes painting, and lessens future repairs, while its durability makes it cheap.

31. *Patent Ships' Pump and Fire-Engine;* A. P. How, 81, Mark-lane.

This pump and fire-engine was fully described and illustrated in the *Mechanics' Magazine*, vol. lxv., No. 1734, page 409.

32. *Patent Double-action "Twin" Pump:* W. Roberts, Millwall.

This machine is composed of two double-action pumps, working with one set of valves, four in number, the valve chamber being cast in a piece with and between the cylinders, so that it occupies scarcely any more room than a common pump, and by removing the air chamber there is free access to all the valves. The sole plate has the suction chambers cast in a piece with it, and each chamber being in communication with a different compartment, by turning the plug in the centre, communication is instantly made with the pump and either compartment, or shifted from one compartment to the other at pleasure; and if the plug be placed so that the port communicates with the sea cock and main hole, and a few strokes be given to exhaust the air, it then becomes a syphon, and any quantity of water can be run into a ship without the labour of pumping.

32A. *Suction Plate;* W. Roberts, Millwall.

This is a modification of the suction chambers mentioned above, and is intended to be used with common pumps.

33. *Patent Double-action Centrifugal Pumps;* Gwynne and Co., Essex-wharf, Essex-street, Strand.

These are centrifugal pumps of simple construction, with their axes horizontal.

34. *Patent Revolving Pump;* A. Parsey, Great Scotland-yard.

This is a rotary pump, furnished with a drum mounted eccentrically in a case, and having retreating spring pistons, after the fashion of some of the early rotary engines.

35. *Patent Chest or Box for the Preservation of Life and Property at Sea;* John Banks, Kerr-street, Northampton.

This chest is adapted for an ordinary clothes-chest, but may be easily and speedily attached to the person and made available as a life-preserver.

36. *Patent High-pressure Fluid Meter;* Thomas T. Jopling, Bishopwearmouth.

See *Mechanics' Magazine*, vol. lxv., No. 1740, page 553.

37. *Passenger Tank Locomotive Engine;* J. V. Gooch, C.E., 34, Great George-street.

This engine was designed for the Eastern Counties Railway.

38. *Express Passenger Locomotive Engine and Tender;* J. V. Gooch, C.E.

This engine was also designed for the Eastern Counties Railway.

39. *Ten-wheeled Double Bogie Tank Passenger Locomotive;* Rothwell and Co.

This engine is one supplied to the Bristol and Exeter Railway. It is very symmetrical in general appearance, being carried upon a central pair of driving wheels, nine feet in diameter, and a "bogie," or American swivelling frame, at each end, each bogie with four wheels, four feet in diameter. With these large driving wheels, each double stroke of the piston carries the engine forward 28·27 feet, so that the pistons have only to make 186 double strokes per mile run by the train.

(To be continued.)

LEATHER CLOTH.

THE *Times* of Wednesday announces the fact that the well-known American house of Dodge, Bacon, and Co., had resumed payment, their suspension having been caused by liabilities in no way affecting the trade position of the firm, which is said to be in a highly prosperous and healthy condition. The house of Dodge, Bacon, and Co., has always been regarded as one commanding considerable mercantile energy, and its rise to its present position is, perhaps, in no slight degree due to the unprecedented advance in the price of leather, which has afforded them the opportunity of introducing throughout Europe a singularly close and valuable imitation, known as "Crockett's Leather Cloth," and which is now applied to most purposes where formerly the skins of various animals were used. This and their India rubber banding, &c., for machinery, to supersede leather, have, from the advance in question, thrown upon the resources of the firm an unusual amount of business. Such discoveries and inventions having placed them in the category of public benefactors, a general sympathy was occasioned by their temporary stoppage.—*Globe.*

ON THE FORM OF SHIPS.

To the Editor of the Mechanics' Magazine.

SIR,—" Semiramis," being a lady, must not be retorted against too roughly, especially as, from the confiding disposition of her sex, she has been somewhat misled by the representations of my other adversary; all, therefore, that I have to say to this lady is, politely to point out the contradiction of censuring experiments performed on a pond as being too lilliputian, and in the next paragraph recommending experiments to be made in a tub.

Pleased with the now modified and moderate tone of " A Mechanic," I recognise in his last letter (p. 272, No. 1754), the more agreeable, if less useful character of a gentleman, and would almost venture to term him a friend. Perhaps, after all, the differences between us are not so serious; though there still remain a few items for elucidation. These have arisen from his too great activity and vigour; he vaults completely over the stalking-horse of discussion, and falls on the other side, instead of contenting himself with the ordinary *sedes argumentorum*, and so causes some trouble, from time to time, in setting him right.

He charges me first with an attempted sophism, but by the sudden interpelation of an interesting essay on the recent history of naval architecture, I am at a loss to gather the precise nature of his charge—it seems, however, to " crop out " further on, where I am made to say that, from the very fact of his profession, he is incapable of pronouncing opinions upon the subjects conneeted with it. Sir, need I write that I did never publish such an egregious statement? I guessed rightly, it seems, when I surmised that " A Mechanic " was in the trade, and I might now safely, I think, hazard the conjecture, from his erratic and impetuous genius, that he is still a young man. Let that pass. What I meant, said, and repeat, is, that most commonly, professional persons are very averse to hear or examine the theories of non-professionals, but that, nevertheless, it so happens, as is now admitted by my interlocutor, that " many important improvements " have been made by such persons, out of the pale —perhaps as many by one class as by the other. Take what line of life we will, we find the most valuable inventions and improvements discovered by amateurs. The design of Brighton pier was not by an engineer, but by a sea captain; a barber invented the cotton spinning machine; a soldier, paper money; and a monk, gunpowder. The cause of this anomaly might easily be explained, but I do not stop to dwell upon it.

I have just shown that my friend has again taken a false step in the very first quotation that he now makes. Let me come to another consideration, which is to place me in a worse category. " A Mechanic " never knew any case in which the Galilean logic was prominently used where the cause was a *good one*, therefore the fact which my argument implies, so far from yielding any assistance, is inimical to me. Q. E. D. Should I call this logic, even in flattery? Because he has not met with such an instance does it follow that there are none?

But Mr. Bland, says my adversary, has not bestowed the study upon the subject which all successful non-professional gentlemen have given; " he is even apparently ignorant of the labours of those who have gone before him." *Apparently*, here, is a happy word. He must be shrewd who would pretend, from perusal of a pamphlet, to declare correctly what studies the author has gone through and what omitted. For my part, I really cannot say if Mr. Bland has carefully read Murray, Stalkart, Knowles, Morgan, Creuze, Fincham, Clairbois, De Chapman, or any of those authors. The very plan of his work, as far as I have gathered, is to take nothing for granted, nothing as known, but to begin at the beginning and pass through the entire feast, *ab ovo usque ad mala*, tasting of all, and pronouncing on them separately. This identical plan, which claims my respect, of admitting nothing as already established, induces " Mechanic " to suppose Mr. Bland possessed no information whatever at commencing.

It seems that it is unfair to draw a comparison between Sir Isaac Newton and Mr. Bland. I admit it; very few can bear the ordeal without derogation; but it would be idle to discuss elaborately the comparison. What I say is, that Sir Isaac's experiments with soap bubbles to test the properties and colours of light (not of balloons), may fairly be set on a par as to insignificance of materials with Mr. Bland's trials of models, nor is one more open to objection than the other.

My friend having said that I had exaggerated the merits of the pamphlet (for it contained " only *one proposal*, pretending to be an improvement "), I thereupon replied that there were at least six (*inter alia*) held forth as improvements, and enumerated them. Unfortunately, I am once more misquoted, and " A Mechanic " endeavours to hammer my meaning into the assertion that I undertake to defend all those six propositions, *à l'outrance*, as axioms. Not necessarily so, but we will see what objections he has to them. First and second, " increased beam " and " reduced average depth "—these two, he writes, " are practi-

cally one and the same." So that, supposing there are three ships, all 150 feet long, one 40 feet wide and of 18 feet draught, the second 42 feet wide and of 18 feet draught, but the third 42 feet wide and of 17 feet draught, "A Mechanic" would repeat that the two latter are one and the same. Mr. Bland's system would make most classes of vessels not only wider, but also shallower than at present.

My correspondent candidly admits that he has made a grave mistake in a former letter, but endeavours to palliate it by saying, that when it is corrected, the tables are turned upon myself. Only by his again falling into error; for our author does not propose a beam of 60 feet (that is the size of existing ships), but he advocates, generally, greater beam, and thus his line of battle ship would not be minus of displacement. He states that strictly a rectangular and very shallow midship section is the best for sailing, stability, &c.; but later in his work he recommends in practice that a somewhat modified form of midship section should be used (like that of the *Espiègle* gun-brig, or of an inverted ogee arch), in order that while the bulk of the bottom is not immersed much more than one-fifth of the beam, the keel may be immersed two-fifths. See No. 1743, where is an approximate figure. My friend will now note the force of my expression, *average*, in conjunction with depth, and also that I have substantiated the consistency and practicability of first increased beam and second reduced average depth.

Notwithstanding that he actually had before him a rough diagram, in my review, to elucidate the purport of "curvilinear bottom longitudinally," "A Mechanic" twists the phrase into quite another meaning. Perhaps when I repeat it in other words, it will be beyond the reach of a mistake:—By Mr. Bland's plan, the lowest part of the bottom, the edge of garboard strakes next keel, would be swept up from amidship in a segment of a circle to the load water line at stem and stern, instead of, as usual, being carried on straight nearly the whole length of the keel and parallel to it. The only importance of these misconceptions is, the proof they afford that my friend has not properly read our author. He takes up the work, disdainful and prejudging, drops upon parts superficially, and then comes forward with discoveries of errors and contradictions which exist nowhere but in his own imagination.

I was under the impression that the centre of gravity was often, without being precise to half an inch, somewhat removed from the load water level; also, in these days of "wave line" doctrines, that it was generally considered a hollow bow was really faster than a convex one, but was supposed to have counterbalancing evils. Hence I inserted, as one of Mr. Bland's novelties, that, on the contrary, convex was superior even in speed to concave.

Our author's remarks about angles in midship sections are met with the special pleader's objection, that literally there are no angles; yet one Descartes, a mathematical trifler, has called even much gentler curves than the bilges of ships "angles."

When my correspondent refers to the experiments in chapter IV. of Mr. Bland's essay, he finds that one model which ought to have weighed 48 ounces, did weigh but 45 ounces, and he ingeniously hints that the results of such an error multiplied to 5,000 tons or 6,000 tons, would be awful. However, I beg to shift that load from the author's shoulders. If the experiment had been solely upon one body to determine its intrinsic qualities to microscopic accuracy, I should grant the inference; but it was not so. The case was, the comparison of four models in sizes which yielded graduated results; and hence a discrepancy of 6½ per cent. in one instance is of but little moment. General results only were wanted to establish an approximate rule, not painful precision to form an exact standard of measurement.

All *readers* "possess the same facilities as myself for acquiring the key to the mysteries of Mr. Bland's book;" for I have never seen nor heard from that gentleman in my existence; but "A Mechanic" will *not* read—*hinc illæ lachrymæ*. He must nevertheless stoop to conquer, and must drag down his soaring mind to the odious task of plodding attention before he will either understand or refute any author, even where the style is as concise and lucid as that of the pamphlet. I am far from wishing to contend that the work is immaculate. Perhaps if "Mechanic" and I were to debate over every chapter, he would re-convince me of the error, while he would himself finally understand justly the nature and results of the experiments, and would work out the last pages with a much higher appreciation of Mr. Bland's labours than at present; but I really must be excused; I am not professed champion to the author, nor his standing commentary. I, too, have another and regular occupation. This sort of discussion, with its quotations, references, and counter references, when much prolonged, becomes tiresome to the general reader, and I am not anxious to carry it further.

I am, Sir, yours, &c.,

H. Y. P.

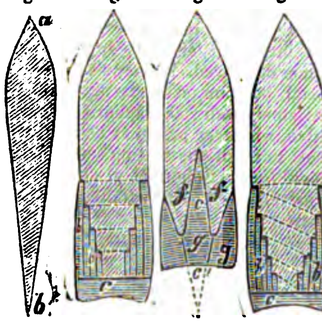
March 26th.

ON RIFLE BULLETS.

To the Editor of the Mechanics' Magazine.

SIR,—I should consider a body of the shape represented by fig. 1 as the most suitable for a projectile; for there would take place during its flight hardly any condensation (resistance) of air at its point, nor at *a*, any rarefaction of air behind (at *b*). The

Fig. 1. Fig. 2. Fig. 3. Fig. 4.



swiftest fishes and birds are propelled by a force from within them, and the organs and limbs by which they propel themselves would greatly tend to retard the speed of their flight, if they were projectiles; that is, if they were propelled by a force that is not within them—a *communicated* force. In order therefore to find out the most suitable shape for a projectile, we should divest those birds and fishes of their organs of motion; and then we find, that they bear a great resemblance to the shape represented by fig. 1.

The greater the specific weight of a substance, the better is that substance suited for a projectile, because it takes up most of, and retains best, the communicated force.

If the propelling force is communicated to the bullet from *behind* (which at the present time is the case with all projectiles; but I fancy, that a *different* mode of communicating that force in *addition* to that at present in use, might be employed with advantage, respecting which I shall give some hints in another communication), then either the *bulk* or the *weight* of the projectile should decrease in the same proportion as, but in a direction *opposite* to, that in which the density of the propelling force decreases; otherwise the projectile would *turn* in its flight, and assume a reversed position. The projectile ought to have a proper "balance of flight."

The rifle bullets, whose sections are represented by figs. 2 and 3, appear to fulfil the required condition best, as they bear most resemblance to the theoretical shape represented by fig. 1. I do not consider those bullets, by which it is intended to stop all windage by the lead of the bullet expanding at the discharge, and filling the grooves, as the best and most advantageous, because by the cavity behind in the bullet being caused to expand, the original shape of the bullet would be more or less destroyed, the "balance of flight" of the bullet thereby be more or less disturbed, and thus the force, speed, and correctness of its flight be more or less affected. The bullet, fig. 2, however, would insure a proper balance of flight, and by means of the wadding (*leather*, &c., &c., *rings*, *b*, and *discs*, *c*,) all windage would be closed up most effectually at the discharge without the shape of the bullet being in the least affected or changed. Bullet, fig. 3, is on a similar principle; the wadding, *g* (consisting of leather, cork, &c.) would, in expanding at the discharge, close up all windage; the cavity behind, *c*, tends to establish a proper balance of flight, and has, in this respect, the same effect, as if a tail, of the shape indicated by the dotted lines *c'* were attached to the bullet. The slanting sides, *f*, tend partly to facilitate *expansion of the wadding*, and chiefly to effect an *easier access of the air*, so as to counteract as much as possible the retarding influence of the rarefaction of air, which naturally would be caused behind the bullet during its rapid flight; and the pressure of the wadding against those slanting sides would counteract the pressure of the wadding in the cavity, *e*, and thus tend to preserve the proper shape of the bullet. The greater accuracy and correctness of the flight of projectiles, that have been shot out of *rifled* barrels, arises from the rapid rotary motion which has been communicated to the projectile by the shape of the barrel, which rapid rotary motion tends to counteract and neutralize the effect of any slight inaccuracies or inequalities in the barrel or bullet, that otherwise would affect the correctness of the flight. The force which is to produce that rotary motion must be a very superior one, so as to overcome and neutralize the above-mentioned influence of such inequalities and inaccuracies, which, though they may be very slight indeed, would considerably affect the flight of the projectile, in proportion to the amount of force that has been communicated at the discharge. Experienced riflemen will have noticed with rifles or muskets, the fire-line of which deviated somewhat from the line of sight, that such deviation became the more considerable the larger the charge of powder they employed in loading the gun. Hence it is evident, that the whole amount of that rotary motion, if it shall at all reach its

purpose, must be communicated to the projectile simultaneously with the propelling force itself, and must be effected either by the propelling force acting directly upon the bullet in such a manner as to cause it to rotate; for which purpose the bullet must have a peculiar appropriate shape, the same as (a spiral) or one similar to that represented by fig. 4; or by an appropriately modified resistance of the barrel, the shape of the barrel being such as to compel the bullet to assume a rotary motion; or by an *active agent* of sufficient strength being contained within the bullet. The rotary motion, which might be communicated to projectiles by the resistance of the air, I consider to be altogether inadequate; and, whatever peculiarity in the shape of the projectile would tend to divert the force of that resistance of the air in a higher degree towards causing the projectile to rotate, would at the same time tend to *lessen* in the same proportion the capabilities of the projectile for a rapid and well-balanced flight. With a smooth barrel, that did not contain even the very slightest inaccuracy, with a bullet of the same proportion, and with a perfectly accurate charge, there might be reached even a much greater accuracy in the flight of the bullet than could be reached with the very best rifle. The construction of a barrel of such perfection is not an impossibility, although there would certainly be required several improvements in the tools and instruments employed for such purposes.

I am, Sir, yours, &c.,

G. J. GUNTHER.

London, Hotel Hamburgh, John-street, Minories, March, 1857.

SPHERICAL VALVES FOR PUMPS, NOT NEW.

SIR,—I observe at page 305 of your last Number, a notice of a patent taken out by Mr. Webster, "for improvements in pumps;" which improvements consist in the use of elastic spherical valves, bedding upon projecting or raised circular valve seats, which valves, says the patentee, "fit on to their seats closely and operate freely without danger of choking." I confess I am somewhat surprised to see a *new* patent, for such an *old* invention. Having used spherical valves, both elastic and non-elastic, for the last twenty years, and having originated a machine for the perfect and economical production of metallic spherical valves, I shall certainly not permit my right to continue their use to be interfered with by Mr. Webster's patent.

The use of spherical valves in fire-engines was introduced many years ago by the late Mr. Read; but on trying his engine against one of Hadley and Simpkin's engines, it was found that when very dirty water had to be used (as generally occurs at fires) the spherical valves did *not* "operate freely without danger of choking."

Elastic spherical valves were introduced by Mr. Freeman Roe, and extensively used in hydraulic rams, pumps, and hydrants. Practice, however, has shown, as I had previously ascertained by experiment, that the elastic spherical valve is a very defective agent; under great pressure they invariably cut into rings, and the spherical form becomes destroyed. Inelastic valves, of glass or metal, bedding on an elastic seating, answer extremely well: the spherical form of the valve, whatever part may bed, preserves the true form of the seating, and maintains a good joint. Spherical glass valves are extensively used in hydrants, and found to answer well.

I am, Sir, yours, &c.,

WM. BADDELEY.

13, Angell-terrace, Islington, March 31, 1857.

AN EXPERIMENT WITH GUN COTTON.

To the Editor of the Mechanics' Magazine.

SIR,—Wishing to ascertain the explosive power of gun cotton, I charged one of my leaden percussion rifle shells with as much gun cotton, as, when moderately pressed, equals in bulk the portion of the wooden plug that projects beyond the cylindrical chamber of the shell. The arrangement is shown in section in fig. 1. I then placed

Fig. 1.

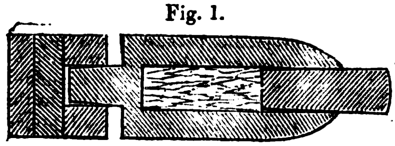


Fig. 2.

the shell so plugged on an iron plate with a fire under it; when the shell was sufficiently heated it exploded, and the en-

graving, fig. 2, shows its appearance then. An earthen flower-pot was placed over it, to prevent its escape. The pot was blown to pieces. Fig. 1 represents the shell, with its tapering shank, to fix the expanding sabôt on, which is made of three circular pieces of sole-leather, glued together. It is thus that I fire elongated *iron* shot and percussion rifle shells from rifles without injury to the grooves of the rifle.

I am, Sir, yours, &c.,
J. NORTON.

THE INDIA RUBBER MANUFACTURE.

To the Editor of the Mechanics' Magazine.

SIR,—Will you kindly permit space in your independent Journal for a few words of warning to any who may, by false reasoning or the subtle persuasions of seemingly well disposed manufacturers, be upon the brink of joining their fortunes to operations on this slippery gum. I wish to call serious attention to the very few who are so lost to all sense of shame as to manufacture caoutchouc goods upon the adulterating system, exposed so recently in your valuable columns, notwithstanding the enormous profits obtained by these small traders. Within the past few months, or at most few years, how many we continually hear of who are quitting, or have quitted, this adulterating process in disgust. Their better morality, alas! seemed for a time perfectly dead and buried, and the philanthropic blood and spirit of their ancestors entirely lost from their memory; and yet, I suppose, the re-created stir in these very latter days, and their return to a more correct sense of what is due to their fellow-men, must be traced in a thankful spirit to the value of proper early training and an honourable parentage. "Luckily for such, the old leaven only sleeps for a period, but will not die eternally." Sundry others, instead of being carefully, and surely, and withal very quickly and hastily (if promises and flattering and enticing words had been fulfilled) transferred into millionaires by the profits on this jerking gum, have, as a substitute, unfortunately found themselves figuring in the Bankruptcy or some other kindred court, while not a few novices have, at it were, by a Providence, just escaped this latter calamity. It seems, therefore, after all, that "honesty is the best policy." Hence (with a daring exception or two, on a small scale,) the manufacture in India rubber this side the Atlantic seems now occupied by the unadulterating or respectable manufacturer.

It is important to observe that this manufacture should be scrupulously avoided where there is the absence of a coal-mine, and water-wheels, and a never-failing supply of water to work them. Their absence will ruin the success of any small caoutchouc works.

I am, Sir, yours, &c.,
A READER.

Croydon, March 24, 1857.

"THE MONOGENESIS OF PHYSICAL FORCES."

To the Editor of the Mechanics' Magazine.

SIR,—In a pamphlet entitled "The Monogenesis of Physical Forces," Mr. Smee puts forward, as the result of "intense study and profound thought," a certain doctrine of attraction, which will be found clearly enunciated in "Grove's Correlation of the Physical Forces," 3rd edition, page 70.

Now, Mr. Smee is, no doubt, a profound thinker, but it is unlucky that his thoughts should only come to surface some long time after the rest of the world has been blessed with the sight of them, originating from another source.

I am, Sir, yours, &c.,
F. H.

London, March 20, 1857.

THE WESTMINSTER CLOCK.

To the Editor of the Mechanics' Magazine.

SIR,—In the controversy going on between Mr. Loseby and Mr. Denison respecting the clock and bell for Westminster, the latter gentleman has taken upon himself the office of trying to persuade the public that no one but himself and Mr. Dent are capable of making a clock, suitable to the requirements of the public, for the Tower at Westminster, at the same time abusing all the unfortunate clockmakers who do not fall into his way of thinking. It was our intention to have left Mr. Denison and his colloquies to their fate, without in any way interfering; but he having thought proper to throw odium upon the trade generally, we, in justice to ourselves, think it right the public should be acquainted with the following fact, namely, that we are not only capable, but (in the event of Mr. Dent failing to carry out what he has undertaken to do) would engage to make and fix a clock that should give every satisfaction to the Chief Commissioner of Public Works, to Sir Charles Barry, the architect, and to the public at large, for even a less sum than that to be paid to Mr. Dent, namely, £1,800; and for this sum we should, in making such a clock, use the

most durable materials, as well as the most expensive (gun metal), the wheel teeth being cut out of the solid, and not cast in, as is the case of the iron wheels that are applied to the clock in question. By the application of gun metal in place of iron, we estimate the extra value of the clock and work, in connection with the hands, to be at least £300.

It certainly does appear rather out of place that Mr. Denison should speak so positively as to what the clock would be under his superintendence in making, and afterwards be obliged to call in the assistance of an engineer, to help him out of his difficulties as a clockmaker. That such is the fact, there can be no doubt, Mr. James, of Broadwall, Stamford-street, having been engaged to remodel the clock.

If such a state of things as this is to pass unnoticed, Mr. Denison may possibly pass off with flying colours; but we believe the public will not readily yield to such proceedings.

We are, Sir, yours, &c.,

B. R. and J. Moore,

Church, Turret, Musical, and House Clock Manufacturers to the Lords of the Admiralty, Her Majesty's Woods and Works, the Honourable Board of Ordnance, the Russian Government and Emperor of China. Number of church clocks, 510; house do., 13,300.

38 and 39, Clerkenwell-close,
March 25, 1857.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Judkins, C. T. *An improved gas regulator.* Dated July 24, 1856. (No. 1760.)

The gas is introduced by a supply pipe into one chamber, and from this passes into a second, but the amount passed is regulated by a valve. The valve is carried by a cover, similar to others in use, having turned down edges, which enter a trough containing quicksilver, and a partition which, with other parts, makes several chambers for regulating the supply of the gas. This cover moves upon bearings, and is adjusted so as to compensate for the varying quantity of quicksilver displaced by the edges of the cover, as one or other end of the cover rises out of or sinks into the same.

Mather, J., and W. Forshaw. *Certain improvements in pickers for looms and apparatus connected therewith.* Dated July 24, 1856. (No. 1761.)

The picker is made with a hollow or recess in that part which is struck by the shuttle lip. In this hollow or recess is fixed a flexible composition which, yielding a little to the stroke of the shuttle, prevents the lip being turned. At the extreme end of each shuttle box is placed a bolster, consisting of either a flexible composition or a spiral spring for the picker to strike against.

Brooman, R. A. *Improvements in grindstones.* (A communication.) Dated July 24, 1856. (No. 1762.)

The outer edge, or grinding surface of grindstones is formed of a number of separate segmental blocks held in place by metal clamps, flanges, or bands, cast in a piece with, or fixed to a web or framework consisting of a ring connected by radial arms to a central boss.

Spencer, G. *Improvements in the couplings of feed pipes of locomotive steam engines, and tenders.* (A communication.) Dated July 25, 1856. (No. 1765.)

The patentee uses a coupling having rings of India rubber, so arranged that they allow —1. Of the angular motion required by the engine in passing curves and points; and, 2. Of the sliding motion required by the varying distances of the ends of the engines and tenders, and at the same time form water-tight joints.

Lord, E., T., A., and W. *Improvements in machinery for opening, blowing, scutching, and preparing cotton and other fibrous substances.* Dated July 25, 1856. (No. 1766.)

This consists—1. In improvements upon the machinery for which former letters patent were granted to the patentee. 2. In a mode of constructing the toothed rollers for blowers, &c. 3. In making the doors placed under the grids of openers, &c., to open and close periodically, by self-acting machinery; also, in connecting the doors to the same handle, so that they may be opened and closed simultaneously. 4. In the combination of differential wheels with the machinery for regulating the feed of blowers, &c., described in the specifications of the patent above referred to, whereby the cone strap has only to communicate the power required for the fibrous substances supplied.

Wood, W. *Improvements in machinery or apparatus for weaving pile fabrics.* Dated July 25, 1856. (No. 1767.)

This relates to the weaving of fabrics where the terry or pile surface is obtained by loose wires—that is, such as are not, when in use, constantly fixed to their carriers or holders; and the improvements consist in employing, for inserting such wires, two lever arms, each of which is capable of being attached for a time to a wire, one for effecting the insertion thereof into the open shed, and the other the withdrawal of it from the pile of the fabric. The invention also comprises modifications of the foregoing arrangement, and certain guide bars, &c.

Byford, T. *Improvements in horses' bits.* Dated July 25, 1856. (No. 1768.)

Two bars or mouth pieces are attached at a distance from each other to the same

cheeks or side pieces, such cheeks having rein rings attached to them at the end of each bar, so that a separate rein may be used to act on each.

STEWART, R. *Improvements in cutting stone and other mineral substances.* Dated July 25, 1856. (No. 1769.)

A sole or bed is laid down, and a carriage carrying the cutting tools traverses upon rails upon the sole or bed, being supported upon wheels, toothed to gear into racks upon the rails or sole. The cutting tools are arranged in a line one behind the other, and each tool is fitted into a socket in the lower end of a vertical or slightly inclined bar, capable of sliding easily in guides attached to the carriage framing. The cutting action is made to take place by raising and letting fall this bar. The bar is lifted by a socket piece embracing it, and which has jointed to its inner side a short lever or eccentric piece which grips the tool bar when the lifting action takes place, taking hold of it higher up as the cut gradually deepens.

WRIGLEY, T. *Certain improvements in machinery or apparatus for cleaning "cotton waste" or other materials used in the manufacture of paper.* Dated July 25, 1856. (No. 1770.)

Several "cone willows" are arranged and have supplied to each, at its delivering end, a feeding apparatus or cloth, so that the cotton waste, &c., may thereby be introduced into the adjoining consecutive "willow," and so on through any number, by self-acting means. The "willows" are so placed that the delivering end of the one shall be opposite to the narrow or feeding end of the next, and so on.

JAY, S., and G. SMITH. *Improvements in stuffing or padding couches, cushions, bedding, chairs, and other similar articles.* Dated July 25, 1856. (No. 1772.)

Tubes, spheres, &c., (of any suitable material) inflated with air are used in lieu of metallic springs, horse hair, &c.

BAGGS, I. *Improvements in apparatus for lighting, signalling, and telegraphing by means of electricity.* Dated July 25, 1856. (No. 1775.)

1. Arrangements are used for the instantaneous ignition of gas, and for turning the same on and off when desired, and for igniting other substances. 2. Arrangements and apparatus are used for signalling on railways; and, also, for notifying the dangerous proximity of trains on the same line of rails. 3. Improvements are made in telegraphing generally, and in the apparatus for such purposes. The chief agency employed is that of frictional or high tension electricity, by whatsoever means produced.

DENIS, J. *Improvements in cutting or perforating steel and other metals.* (A communication.) Dated July 25, 1856. (No. 1776.)

The metal is subjected to the action of acids, the parts to be preserved being coated with varnishes or wax. Two kinds of varnishes are used—a protecting varnish, and a decorating varnish. The latter is composed of bitumen, 25 parts; thick brown varnish, 50 parts; pure spirits of turpentine, 15 parts; pure yellow wax, 10 parts; the protecting varnish of, thick copal varnish, 90 parts; pure yellow wax, 10 parts. The protecting wax is composed of pure yellow wax, 40 parts; white Burgundy pitch, 50 parts; tallow, 10 parts.

HODGES, C. *Improvements in apparatus for unwinding silk, thread, or yarn from the hank.* (A communication.) Dated July 26, 1856. (No. 1778.)

Instead of employing a person to hold the hank or skein stretched out between the hands, the patentee constructs an apparatus of two clips attached to an elastic band. The clips clip the edges of a table, or penetrate the seat of a sofa or of chairs, a table cover, &c., so as to stretch the hank or skein. The clips have also each a vertical pin, on which is a loose bobbin or spool to receive the hank.

PAULING, R. C. *Improvements in giving increased buoyancy to ships and vessels, in raising sunken vessels, in keeping structures water-tight, and in propelling vessels.* Dated July 26, 1856. (No. 1779.)

1. Water is expelled from, and kept out of vessels which have sprung leaks or become water-logged, by forcing into such vessels compressed air. 2. Vessels that have sunk are raised by forcing compressed air or steam into them. 3. Buoyancy is given to vessels by forcing steam into receptacles connected to them. 4. Floating vessels are propelled by discharging compressed air therefrom against the water.

DICKINSON, J. *Improvements in anchors, and in the manufacture of the same.* Dated July 26, 1856. (No. 1780.)

The "togles" of swivel anchors are attached to the anchor arms by a working joint. These "togles" are projections on the back of the arms, applied to cause the arm in contact with the ground to open out from the shank.

YEADON, S., and G. CHAPMAN, *Improvements in the construction of reeds for weaving, and in machinery or implements and materials to be used in such construction.* Dated July 26, 1856. (No. 1781.)

This consists in preparing a cement for uniting the parts of reeds, and in connecting together the parts of certain instruments ancillary to some of the improved processes in the fabrication of such reeds; in uniting the parts of reeds by the cement

in lieu of a lap or waxed band; and in determining and preserving the set of reeds. Gutta percha forms an efficient cement for uniting the parts of reeds, but the cement preferred is composed of pitch, gutta percha, and caoutchouc. The invention cannot be clearly described in detail without engravings.

COOKE, G. C. *Improvements in stereoscopes.* Dated July 26, 1856. (No. 1782.)

This consists—1. In the application to stereoscopes of conical, or pyramidal, or trumpet-mouth tubes for the eye-pieces, the object of this, in conjunction with other improvements, being to increase the field of view. 2. In the adaptation to the eye-pieces of stereoscopes of additional moveable lenses of various kinds adapted to different kinds of sight. 3. The adaptation to stereoscopes immediately above the space occupied by the picture of a double "passe partout" or frame, for preserving uniformity of size in the pictures, as well as to prevent any light from being reflected from their margin and confusing the eye.

REMINGTON, H. *An improved gas heating and cooking apparatus.* Dated July 26, 1856. (No. 1783.)

The patentee forms a gas-burning apparatus suitable for the mulling of wines, beer, and other similar liquors, and for the boiling or heating of other fluids, combining therewith the means of broiling or other dry cooking.

ROBINSON, H. *Improvements in arrangements and mechanism for the conveyance or transport of loads or weights.* Dated July 28, 1856. (No. 1786.)

This is particularly applicable to the transport of coals and other minerals. It consists in applying an endless rope or chain, supported on pulleys, passed round a drum or a series of pulleys at each terminus. Rods are attached at intervals to the endless rope, on which rods the loads are suspended. The pulleys have only bearings on one side, and the rods are bent or curved so as to pass on one side clear of the pulleys. Or the rope may be placed between two pulleys, the rod passing between them. Motion is imparted by rotating the drums at the termini.

EABORN, E., and M. ROBINSON. *Certain improvements in machinery to be used for confectionary purposes.* Dated July 28, 1856. (No. 1787.)

Mechanical arrangements are used for crushing sugar to a powder, for facilitating the forming and dividing confectionary articles or goods made of sugar, and are also applicable for forming medical pills, &c.

NEWTON, W. E. *An improved instrument for taking altitudes.* (A communication.) Dated July 28, 1856. (No. 1788.)

Claim.—The combination of a vibrating pendulum, indicator, or pointer (capable of being fixed at any given point), with a graduated dial to which sights are adapted.

GRIFFIN, W., and E. DULEY. *Improvements in studs and buttons for fastening articles of dress.* Dated July 29, 1856. (No. 1791.)

This invention consists in connecting studs, buttons, &c., by passing a shank through the garment, and screwing a nut on at the back. Another improvement refers to covered buttons, and consists in the application to them of a flexible loop attached by means of the metal shell through which (in ordinary buttons) the tuft or the part to be sown to the garment projects.

KNOWLES, J. and W. BUXTON. *Improvements in tuyères.* Dated July 29, 1856. (No. 1793.)

Claim.—A tubular tuyère laid in a spiral form, the water used for keeping it cool passing at once by a pipe direct to the nozzle of the tuyère, and returning by the coil.

NEWTON, W. E. *Certain improvements in the process of generating illuminating gas.* (A communication.) Dated July 29, 1856. (No. 1794.)

This relates to generating gas from rosin, grease, oil, tar, &c., which are in a liquid state, or become so on being heated. 1. The rosin, grease, &c., is mixed with some porous, cellular, or coarse substances, which contain no gas, and are slow conductors of heat. The mixture is introduced into the retort in a separate vessel, so that the contents, when expelled by heat, escape in contact with the perforated bottom of the retort where the heat is most intense. 2. With the gas-generating retort is combined a steam-generating retort, to supply steam to assist in decomposing the vapours in the retort, and to carry off the permanent gas from the retort rapidly, to prevent the deposition of carbon.

SIEVIER, R. W. *Improvements in preserving wood from decay, and also from destruction by insects.* Dated July 30, 1856. (No. 1799.)

Wood when saturated with materials for preserving it is subjected to pressure, between rollers or otherwise.

EVETTE, H. *Improvements in looms for weaving.* Dated July 30, 1856. (No. 1800.)

This consists in arrangements for throwing the shuttle in hand and power looms by mechanical means.

DENIS, J. *An improved gelatinous and economical soap.* (A communication.) Dated July 30, 1856. (No. 1801.)

This new soap is composed of best curd or white soap, 2 lbs.; pearlash, 1 lb.; quick lime ¼ of a lb.; chloride of lime in powder, 1-20th of a lb.; gelatine 2 oz.

HOLCROFT, G., and P. JOHNSON. *Im-*

provements in the manufacture of cement, and in the application of a known material to cementing purposes. Dated July 31, 1856. (No. 1805.)

This consists in manufacturing cement of sulphur combined with sand, gypsum, &c.; also, in the application of sulphur alone for cementing the joints of stones, or as a general substitute for cement.

TORASSA, C. J. B. *Improvements in obtaining motive power by the aid of explosive gases.* Dated July 31, 1856. (No. 1807.)

The explosive power of amalgamated gases with atmospheric air is to be used, the explosion being effected by means of a galvanic battery.

NEWTON, W. E. *A new musical instrument to be played by the agency of steam or highly compressed air.* (A communication.) Dated July 31, 1856. (No. 1809.)

This consists of a number of steam whistles, of proper sizes and thicknesses, and with proper apertures to produce any desired musical scale, and provided with separate valves. The valves are opened, either by fingering keys, or by the rotation of a studded barrel, or by any other means. One important feature of the invention is a peculiar valve employed.

NEWTON, W. E. *A new or improved process for obtaining aluminium.* (A communication.) Dated July 31, 1856. (No. 1810.)

The inventors employ vessels of iron, of varying form, but generally approaching that of crucibles, pots, or seggars, in which vessels the reaction is effected as in vessels of clay. They have also effected the reduction in chambers of brickwork or fire-clay. The apparatus employed by preference is a reverberatory furnace, the bed of which, having a portion of it inclined, is arranged for facilitating the collection of the metal as it is produced. Another improvement consists in modifying the composition of matters for affecting the reaction. This is effected by dispensing with marine salt, and adding fluoride of calcium.

BROOMAN, R. A. *An improvement in the construction of carriages and wagons.* (A communication.) Dated July 31, 1856. (No. 1811.)

This consists in the application of India rubber to a variety of the parts, whereby not only is rattling noise obviated, but the bolts are not liable to break, nor the nuts to work off.

BROOMAN, R. A. *An improved auger or boring tool.* (A communication.) Dated July 31, 1856. (No. 1812.)

An expanding or adjustable auger or boring tool, much after the plan of a "lip bit," is formed, and there is inserted in the shaft thereof a cutter, which, following the first, cuts away the material at the bottom, so as to make the hole larger; by delicately adjusting this a hole may be produced of any desired size within the limits of the tool.

CHAMBLANT, P. M. J. *Improvements in the manufacture of glass.* Dated July 31, 1856. (No. 1813.)

This consists in passing a current of air, gas, or vapour, through glass when it is in a fluid state. A platina pipe descends to the bottom of the pot for the purpose.

COLTMAN, W. *Improvements in knitting machinery.* Dated July 31, 1856. (No. 1814.)

This consists in certain improvements in the needles or instruments on which the loops are formed, and in the mode of widening and narrowing the work made in knitting machines. A description of them would necessarily be lengthy.

WICKSTEED, T. *Improvements in separating sewage and other matters from water or fluid mixed therewith.* Dated July 31, 1856. (No. 1815.)

The waters are raised into reservoirs above the filtering apparatus, by endless chains of buckets. From the bottom of each reservoir a pipe descends. In each supply pipe is a cock to shut off the supply. The filtering apparatus used is moved under and from the supply pipe on a railway below, by which, when a filter becomes full, it may be readily removed, and another brought into position. The filtering apparatus used consists of a series of planks, in both sides of which grooves are cut, and a cover of gauze or perforated metal and a surface of woven fabrics are fixed at their edges on either side of each of the planks. Several planks are placed one on the other, and held between a top and bottom plate, in the upper of which is an air tube and cock for the passage away of air.

ROUTLEDGE, T. *Improvements in the manufacture of half stuff and paper.* Dated July 31, 1856. (No. 1816.)

The patentee claims the treatment of esparto and other raw fibres by a ley containing more lime than is necessary to render the alkali caustic, and afterwards boiling and rinsing the fibre in a solution of carbonate or bicarbonate of soda.

TOLHAUSEN, A. *A new and improved flexible pocket umbrella, being likewise applicable to common and other sticks, canes, &c.* (A communication.) Dated Aug. 31, 1856. (No. 1818.)

This relates to umbrellas with folding ribs and jointed handles, or fixed by rings and screws upon common and other sticks, canes, &c., and cannot be described without engravings.

BRETT, J. W. *Improvements in letter and numeral printing electric telegraphs.* Dated Aug. 1, 1856. (No. 1819.)

The patentee describes certain arrangements by which communications are printed, and by which the repetition or perpetuation of errors is avoided. He gives the details of both the receiving and the sending instruments.

WOOD, W., and M. SMITH. *Improvements in looms for weaving terry and cut-pile fabrics.* Dated Aug. 1, 1856. (No. 1820.)

This consists—1. In certain machinery applicable to such looms for inserting and withdrawing the wires. 2. In the application of a hook or instrument so formed that the heads of the wires can be connected to, liberated from, and pass through it without any opening or closing action, this hook to be used in combination with means for inserting and withdrawing wires. 3. In the application of a head or block to each wire in addition to the usual head of the wire, and of a guard or guide-piece by which, and the additional head or block, the wires are guided in their proper places and held upright in the fabric. 4. In the application of improved stop-pieces for regulating the position of the heads of the wires.

WOOD, W., and M. SMITH. *Improvements in apparatus for cutting the wires out of terry fabrics.* Dated Aug. 1, 1856. (No. 1821.)

This consists in improvements upon a former patent granted to the said William Wood, and cannot be described without engravings.

AVERY, J. *Improvements in bonnets and other coverings for the head.* (A communication.) Dated Aug. 1, 1856. (No. 1822.)

Springs, or suitable springy materials are encased in a soft, flexible, fibrous substance, to give form and elasticity thereto; or in strips of woven fabric having stiffness and elasticity (muslin, for example), and thus formed into rolls for use.

CHEVALIER, E. P. *Improvements in the manufacture of cigars.* Dated Aug. 1, 1856. (No. 1823.)

Leaf tobacco is made into cigars in certain moulds and presses, the latter of which the patentee terms "*presse-cigars.*"

TILGHMAN, R. A. *Improvements in hydro-extractors or centrifugal machines.* Dated Aug. 1, 1856. (No. 1824.)

This consists in removing the solid matter, and cleansing the filtering fabric while the machine is in motion, by reversing the surfaces of the said fabric.

REEVES, R. *Improvements in machinery for sowing or depositing seeds and manure.* Dated Aug. 1, 1856. (No. 1825.)

This invention was described and illustrated at page 265 of No. 1754.

LONG, O. *Improvements in mechanical knife-cleaners.* Dated Aug. 2, 1856. (No. 1827.)

Apparatus is used for holding the handles of several knives between narrow boards by means of moveable stops and thumb screws; and a suitable holder for knives is combined with a knife board so that the blades may be laid flat side by side, and be pressed down on the surfaces of the board whilst one side of the blades is being cleaned, and then, without taking the handles from the holders, the whole may be reversed and the other side cleaned. See *Mech. Mag.* p. 486, No. 1737.

BROOMAN, R. A. *Improvements in the manufacture of artificial fuel.* (A communication.) Dated Aug. 2, 1856. (No. 1828.)

Two or more different descriptions of fuel are reduced separately to a powder, and then mixed in the desired proportions, and afterwards baked or burnt into fuel. In the compound fuel what may be deficient in density, richness of carbon, or porosity in one is compensated for by the other.

DONKIN, T. *Improvements in the glazing of paper.* (A communication.) Dated Aug. 2, 1856. (No. 1829.)

This consists in a method of wetting paper, and then passing it through glazing rolls. It cannot be fully described without engravings.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

CATTAERT, C. F. *Improvements in the stoppering of inkstands, bottles, pots, jars, and other vessels, and closing cocks.* Dated July 24, 1856. (No. 1763.)

A flat or other surface of glass is brought over the mouth of bottles, &c., being ground to fit accurately. The two are pressed together by a spring or cover above the piece of glass, and fitted to a cover or cap. To close the fluid-way of cocks or taps the inventor fits a screw plug into the body of the tap, having at bottom a piece of glass, which, when the plug is screwed down, lies flat upon another piece fixed in the fluid way, the surfaces being ground true. Modifications are also described.

BOUSFIELD, G. T. *Improvements in the manufacture of vulcanized India-rubber thread.* (A communication.) Dated July 25, 1856. (No. 1764.)

The India-rubber compound having been properly masticated, is, whilst hot, rolled into a sheet between two rollers, and immediately divided into thread by rollers (one or both being grooved) and the thread is then vulcanized by heat. The rolled out sheets may be subjected to artificial cold, to harden them, when they may be cut into threads, like India rubber, and then vulcanized.

JOHNSON, J. H. *Improvements in scutching machines.* (A communication.) Dated July 25, 1856. (No. 1771.)

Air is admitted into the scutching machine at two places, separated from each other at the under side of the drum, by making two openings in the concentric plate which encloses the lower portion of the drum. These openings are furnished with regulating air-valves or registers, and are separated from each other by a partition. The first is situated below the feeding roller, and the second at or near the bottom edge of the curved plate.

HOWES, E. *An improved construction of anchor.* (A communication.) Dated July 25, 1856. (No. 1773.)

The object is to permit the stocks of anchors to be turned parallel with the arms, that the stowage may be effected without unstocking the anchors. The shank has a shoulder at its upper part, and, immediately above this, is squared to fit the socket in the stock. This squared part is equal in length to the thickness of the stock, and above it the shank is rounded and slotted to receive a cottar. To turn the stock, it is only necessary to drive out the cottar, lift the stock off the squared part, and turn it.

ANDERSON, W. L. *Improvements in propellers.* Dated July 25, 1856. (No. 1774.)

Each propeller is composed of two, four, or more paddles carried upon arms free to turn in their supports, and feathered by an arrangement of cogs.

PLATT, J. *Improvements in door knockers.* Dated July 26, 1856. (No. 1777.)

A handle on the outside of the door causes a knocker to strike on the inside. The handles may turn, or pull out, or push inwards; and the knocker may be connected with the outside handle by springs, ratchet wheels, &c.

COPLIN, J. *Improvements in ships' windlasses.* Dated July 28, 1856. (No. 1784.)

A double purchase windlass is constructed by applying on the barrel on each side of the main paul, a ratchet wheel; and in adapting to each wheel two paul carriers, each provided with three pauls. These carriers are connected by rods to levers whose fulcrums are upon a standard across the ship, or parallel with the windlass barrel. The levers are consequently worked at right angles to the windlass barrel, and power is applied directly through the pauls and levers.

RITCHIE, G. *Improvements in the manufacture of boots and shoes from materials not hitherto used for that purpose.* Dated July 28, 1856. (No. 1785.)

The heels and soles of boots, &c., are made of a composition consisting of a hard mineral substance, mixed with gutta-percha, India rubber, or other substance suitable for cementing the particles of the mineral together. The mineral preferred is corundum.

NEWTON, W. E. *Certain improvements in steam engine governors.* (A communication.) Dated July 28, 1856. (No. 1789.)

This relates to centrifugal ball governors, and its chief feature consists in the suspension of the governor spindle at or near the top, by a ball and socket joint, or any contrivance to form an universal joint, so that it may always be caused by gravitation to maintain a vertical position.

LIVSEY, P. J. *Improvements in arrangements and mechanism for rotating and retaining the rollers of window blinds.* Dated July 29, 1856. (No. 1790.)

1. A ring of metal is used, and through it the cord of the blind is passed; to this ring one end of a vulcanized India-rubber band is attached, and the other end is secured on a stud in the window frame. 2. A spring of India rubber or of spiral metal is used to exert a pressure on a ring or frame with an anti-friction bowl round which the cord passes, so as to keep a tension on the cord. 3. An elastic cord is used for blind rollers.

BOWERS, H. R. *Improvements in machinery or apparatus for grinding, crushing, or pulverizing clay and other substances.* Dated July 29, 1856. (No. 1795.)

This refers to apparatus in which the crushers are caused to revolve by a circular plate or disc, and consists, 1. In adapting a revolving false bottom or disc for the crushers to run upon, so that the smaller particles will fall through and be removed from the crushers. 2. A suitable apparatus is used for sweeping the material on the plate or disc in such a manner that the smaller particles may fall through, the remainder being again caused to pass under the crushers.

DAVIES, G. *An improved portable apparatus for copying letters and other manuscripts.* (A communication.) Dated July 29, 1856. (No. 1796.)

To a small roller, rather longer than a sheet of letter paper, a square piece of India-rubber cloth (or leather cloth, &c.) is attached by one edge. The roller may be hollow and contain writing materials and paper, &c. In using the apparatus the cloth is unwound, and a letter written with copying ink, and a piece of thin damped paper, are laid thereon. The roller is then rolled firmly over the cloth, so as to wrap the cloth, letter, and paper round it, and the copy is thus obtained.

ANDERSON, A. W. *Improvements in refining sugar.* Dated July 29, 1856. (No. 1797.)

The inventor dissolves sulphate of copper in boiling water (3 lbs. of sulphate to 1 gallon of water), and adds granulated tin, until all the copper is precipitated. The filtered liquid will be a colourless solution to be used in sugar refining.

CARON, F. *Improvements in fastening the handles of door locks and door finger plates.* Dated July 30, 1856. (No. 1798.)

In fastening the handles of door-locks, one handle slides on the spindle, and secures it by a cross slide passed through the small part of the handle nearest the door, and received into notches cut in the spindle. In fixing finger plates, hooked projections are fixed to the door, and suitable catches formed in the plate, whereby it may be fixed by pressing the plate to the door, and sliding the plate in the proper direction.

BROOMAN, R. A. *Improvements in ladies' skirts or petticoats, and dress improvers or bustles.* (A communication.) Dated July 30, 1856. (No. 1802.)

The inventress forms at the top and back part of petticoats and bustles a light flexible framework or "shape," consisting of strips of thin steel, whalebone, &c., attached at top to a band made to hook round the waist, and at bottom to a narrow curved plate or band, the ends of which are united towards the front round about two-thirds of the body.

SIMONS, F. C. *An improvement in rifling the barrels of fire arms and ordnance.* Dated July 30, 1856. (No. 1803.)

In cutting the rifle grooves, the two sides of a groove are made tangents to the circle of the bore, and the sides of the groove are connected by a straight or curved line.

HOPWOOD, J. *Improvements in machinery for measuring and folding fabrics.* Dated July 31, 1856. (No. 1804.)

The fabric to be measured and folded is passed over a revolving reel having four spokes, adjustable on the axle to suit the width of fabric, and between each pair of spokes a rail.

KERR, J. J. *Improvements in the manufacture of cartridges for fire-arms.* Dated July 31, 1856. (No. 1806.)

In forming each cartridge Brande's patent metallic tubing is used. The powder rests on the closed end of the tube, and then a disc of prepared material is placed to prevent contact between powder and ball. The latter, if conical, will be placed with the base next the powder, and encircled with a patch of grease. The metallic tube is then closed over the ball. Modifications are proposed.

PROVISIONAL PROTECTIONS.

Dated January 5, 1857.

38. Henry Alfred Jowett, of Sawley, Derby, civil engineer. Improvements in steam engines.

Dated January 20, 1857.

163. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. An improvement in the manufacture of hosiery. A communication.

Dated February 18, 1857.

477. Thomas William Davenport, of Birmingham, and Samuel Cole, of Aston-manor, Warwick. A new or improved method of manufacturing and ornamenting articles in papier maché and charcoal.

Dated February 20, 1857.

503. Isaac Aldebert, coachmaker, of Long-acre, London. An improved shackle for the springs of carriages.

Dated February 28, 1857.

594. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris. Improvements in finger and other rings. A communication.

Dated March 3, 1857.

617. Giacomo Sileoni, of Genoa, Sardinia, merchant. Obtaining starch from a plant called arum maculatum and arum Italicum, and from all other roots and plants of the arum genus.

Dated March 4, 1857.

630. Rudolph Bodmer, of Thavies-inn, Holborn, London. Improvements in apparatus for steering ships. A communication from J. D. Ghersi, of Genoa.

634. Thomas Wright Gardener Treeby, of Westbourne-terrace-villa, Paddington. Improvements in sewers and gulleys, and outfall to sewers and gulleys, and of sewage.

636. William Edward Newton, of Chancery-lane, civil engineer. Certain improvements in machines for cutting standing crops. A communication.

638. James Stephens, of Northampton-road, Clerkenwell, metal worker. Improvements in paint brushes, and in similar kinds of brushes.

Dated March 5, 1857.

640. William Frederick Taylor Bradshaw, o Sheffield, palette knife manufacturer. Improvements in making palette and other like knives.

642. Jean Louis Frédéric Bardin, of Paris, merchant. A new mode of ornamentation.

644. William Holland, of Birmingham, tool maker. A new or improved manufacture of runner notches and top notches for umbrellas and parasols.

646. Anthony Ansens, of Paris, copper smith mechanician. Improvements in moulds or forms for loaves of sugar.

648. John Woodley and Henry Herbert Swinford, both of Limehouse, Middlesex, coopers. Improvements in sawing machines.

652. William Edward Newton, of Chancery-lane, civil engineer. An improved manufacture o tracing cloth. A communication.

654. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in machinery for compressing clay and other materials applicable to the manufacture of bricks and other articles. A communication.

Dated March 6, 1857.

658. William Findlater, of Birmingham, coach builder, and William Keetley, of Birmingham, coach builder. An improvement or improvements in carriages.

660. Georges Danré, engineer, and Pierre Fortuné Victor Mouillard, gentleman, and Pierre

Adrien Mercier, gentleman, of Paris. Improvements in carbonizing or distilling wood, peat, oil cake, coal and other substances for the production of gas for lighting, in carburetting or increasing the illuminating effect of and in compressing gas, also in the apparatuses employed for such purposes.

662. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in furnaces and fire-places. A communication from A. E. Dussard, of Marseilles.

Dated March 7, 1857.

666. George Hawksley, of Bromley, Middlesex, engineer. An improvement in constructing apparatus for heating and cooling air, steam, and other fluids.

668. William Urquhart, of New Oxford-street. A new mode of ornamenting household furniture.

670. Robert James Maryón, mechanician, of Hooper-street, Westminster-road, Surrey. Improvements in the construction of steam locomotive engines.

671. Patrick McGrade, of Upper Liffy-street, Dublin. Improved machinery or apparatus for propelling ships or boats.

672. Richard Archibald Brooman, of 166, Fleet-street, London, E.C., patent agent. An improved method of, and apparatus for, maintaining the water level in boilers. A communication.

Dated March 9, 1857.

677. Frederick Shand Hemming, of Westminster, mining agent and engineer. Improvements in the manufacture of railway chairs and sleepers.

Dated March 11, 1857.

703. George Mountford, of Caledonian-terrace, Leeds, surveyor. Improvements in machinery or apparatus for cutting or chopping loaf sugar, roots, and other substances.

705. Charles Emile Giajola, of Birmingham. Improvements in moderator lamps.

707. William Boden, of Blackwall, Poplar, gas-fitter. Improved apparatus for flushing water closets and urinals.

709. William Hale, of Swan-walk, Chelsea, engineer. An improvement in rolling iron and steel.

Dated March 12, 1857.

711. Joseph Jules Derriey, of Paris, mechanician. Improvements in machines for manufacturing lozenges, wafers, or pastilles of pasty materials.

713. John Avery, of Essex-street, Strand. An improved method of purifying schistous or bituminous oils. A communication from C. Camus and J. Missillier, of Paris.

715. George Travis, of Mercaston, Derby. Improvements in apparatus used in the manufacture of cheese.

717. William Edward Newton, of Chancery-lane, civil engineer. Improved machinery for drawing and preparing silk, cotton, wool, flax, hemp, and other fibrous substances. A communication from A. L. Warnery, of Lyons.

Dated March 13, 1857.

719. Thomas Horne, jun., of Birmingham, manufacturer. A new or improved method of ornamenting metallic bedsteads and wash-hand stands.

721. Samuel Lawrence Taylor, of Cotton End, Bedford, machinist, and Thomas Eaton Rolfe, of Northhill, tailor. Improvements in boilers for generating steam, heating water, and for other heating or boiling purposes.

723. William Westbrooke Squires, of Liverpool, doctor of medicine. Improvements in the means of letting on and drawing off water and other fluids.

725. Edmond Joseph Nicolas Juvin, of Paris, gentleman. Improvements in producing printing surfaces.

Dated March 14, 1857.

727. John Wheatman and John Smith, saw-manufacturers, of Sheffield. Improvements in the mode of grinding circular saws.

729. Henry Bridges, of Bridgewater, Somerset, engineer. Improvements in buffing, bearing, and draw springs, and buffer-cases for railway purposes.

731. Martin Nunn, of Hampstead, Middlesex, gentleman. Certain improvements in machinery or apparatus for washing or cleansing clothes, piece-goods, and other articles.

733. Thomas Bowden, of Pendleton, Lancaster, millwright. Improvements in apparatus for discharging the water resulting from the condensing of steam, used in apparatus heated by steam.

Dated March 16, 1857.

737. Henry Glaysher, of the Isle of Wight, engineer. Improvements in steam-engine boiler and other furnaces.

739. George Joseph Hall, of Archer-street, St. James's, Middlesex. An improvement in finishing fabrics made wholly or partly of silk.

741. Richard Archibald Brooman, of 166, Fleet-street, London, E.C., patent-agent. Improvements in zincing or coating metals with zinc, and in cleaning metals. A communication.

Dated March 17, 1857.

743. Nathaniel Jones Amies, of Manchester, smallware-manufacturer. Certain improvements in machinery or apparatus for polishing and finishing yarns or threads.

745. Henry Boswell Palmer, of Bermondsey, Surrey, woolstapler. An improved fire-lighter.

749. William Edward Newton, of Chancery-lane, civil engineer. Certain improvements in folding window-blinds and shutters. A communication.

751. Modeste Anquetin, of Paris, watchmaker. An improved traveller's watch.

753. William MacNaught, of Rochdale, engineer. Certain improvements in engines worked by steam or other motive power, and in their gearing for connecting them with machinery, and in the means of lubricating such engines.

755. George Forsyth, of Stakeford Foundry, Maxwelltown, Kirkcudbright, engineer. Improvements in steam cooking-apparatus.

Dated March 18, 1857.

757. John Millar, of Edinburgh, glass-merchant. Improvements in stoppers or closing apparatus for decanters, bottles, and other receptacles.

759. Jacob Green, of Philadelphia, United States. Improvements in gas-consuming furnaces, and in the automatic action of the controlling valves or dampers of the said furnaces.

761. James Murdoch, of Staple-inn. An improved process for imitating the skins of animals upon fulled cloth. A communication from J. Picque and C. Piot, of Paris.

763. John Wilkes, Thomas Wilkes, and Gilbert Wilkes, all of Birmingham, manufacturers. A new or improved manufacture of rollers or cylinders for printing fabrics.

765. Sir James Caleb Anderson, of Fermoy, baronet. Improvements in locomotive and other carriages.

767. Richard Johnson, of Manchester, wire-drawer. Improvements in cleaning iron and other metals, after the manner known as pickling.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," March 31st, 1857.*)

2720. W. Healy. Improvements in furnaces and boilers and hot-water apparatus, for heating purposes.

2735. T. Hindle. Improvements in the manufacture of textile fabrics.

2738. G. Watson and C. Satterthwaite. Improvements in the manufacture of fire-lighters.

2755. J. Norman. Improvements in propelling navigable vessels.

2757. J. W. Clare. Improvements in preventing, removing, consuming, and condensing smoke and noxious vapours, and in apparatus for those purposes.

2762. W. Jacobs. An improved composition for bedding and rendering bricks in furnaces.

2768. A. Clark. Improvements in the application and construction of revolving window-shutters, and blinds, and metal window-sashes.

2769. W. T. Henley. Improvements in electric telegraphs, and apparatus connected therewith.

2772. W. K. Hall. Improvements in machinery for cutting, punching, and shaping metals.

2776. J. S. Wright. Improvements in the manufacture of paper, or papier-maché, and metal buttons.

2779. W. E. Newton. Certain improvements in railway carriages. A communication.

2787. H. Brickley. Improvements in mills for grinding.

2792. H. Bragg, jun. Improvements in drying or extracting moisture from air, and in machinery or apparatus for starching, clearing, drying, stretching, and finishing fabrics.

2800. J. Brown and J. Adin. Certain improvements in Jacquard machines.

2807. A. Lees and D. Schofield. Certain improvements in self-acting mules for spinning and doubling.

2824. C. W. Siemens. Improvements in fluid-meters.

2826. W. Johnson. Improvements in projectiles. A communication.

2832. R. Harmer. Improvements in stereoscopic pictures.

2838. J. C. Haddan. Improvements in pianofortes.

2839. J. Gibson. Improvements in buffing and drawing apparatus.

2842. G. J. Vertue. An improvement in deodorizing sewage waters and sewage matter when lime is used.

2846. N. Monnier. Improvements in bridles and bits for stopping horses.

2864. F. A. Gatty. Improvements in the construction of filters or drainers.

2885. R. Davison and J. Crowther. Improvements in machinery for winding yarns or thread on bobbins or pirns fixed on spindles driven by gear or cogged wheels, and for winding weft for either hand or power looms.

2886. H. Moore. A boot and shoe stud.

2896. C. Schiele. Certain improvements in machinery or apparatus for cutting nuts, screws, or bolts, and toothed wheels.

2990. F. Levick, jun., and J. James. Improvements in the mode of utilizing the waste gases of blast furnaces.

3016. G. A. Harrisson. Improvements in breech-loading fire-arms.

3029. W. H. Stratton. Improvements in the fire-doors of furnaces.

3047. F. Dehaynin. Improvements in machinery for moulding and pressing artificial fuel and plastic substances, and for driving the same from the moulds.

58. J. Morris. Improvements in washing machines.

177. W. C. Scott. Improvements in apparatus for separating coin.

229. R. A. Brooman. A method of lubricating and preventing the heating of axles, journals, and bearings in railway engines and carriages. A communication.

233. J. H. Johnson. Improvements in sewing machines. A communication.

290. H. Whittles and R. Schofield. Improvements in the construction of the slide valves of steam engines, and in the mode of working the same for the better regulation of the vacuum in the cylinders thereof, economising fuel, and for insuring safety and steadiness of such machines whilst in action.

357. J. Taylor and E. Owen. Improvements in the manufacture of yellow prussiate of potass.

443. J. Taylor. Improvements in the preparation or manufacture of manures.

453. A. Parkes. Improvements in the manufacture of nails.

539. J. Betteley. Improvements in machinery for lifting and working anchors, cables, and other weights on shipboard.

598. J. Murphy. Improvements in securing screw nuts on their bolts, and bolts in plates.

606. T. Rose, jun. Improvements in apparatus for cutting or disintegrating vegetable substances.

630. R. Bodmer. Improvements in apparatus for steering ships. A communication.

640. W. F. T. Bradshaw. Improvements in making palette and other like knives.

648. J. Woodley and H. H. Swinford. Improvements in sawing machines.

654. G. T. Bousfield. Improvements in machinery for compressing clay and other materials applicable to the manufacture of bricks and other articles. A communication.

697. J. Neuenschwander. Improvements in the process of preserving milk.

703. G. Mountford. Improvements in machinery or apparatus for cutting or chopping loaf sugar, roots, and other substances.

709. W. Hale. An improvement in rolling iron and steel.

719. T. Horne, jun. A new or improved method of ornamenting metallic bedsteads and wash-hand stands.

735. W. Pidding. Improvements in machinery or apparatus for the manufacture of piled fabrics, whether plain or figured.

755. G. Forsyth. Improvements in steam cooking apparatus.

761. J. Murdoch. An improved process for imitating the skins of animals upon fulled cloth. A communication.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

694. Samuel Humphreys.
699. James Robertson.
709. James Alexander Manning.
733. Philip John Bassavant and John Cure.
739. Archibald Douglas Brown.
752. John Henry Johnson.
756. George Fergusson Wilson and William Walls.
761. Richard Edward Hodges.
785. Stephen Randoll Smith.
793. Simon O'Regan.
819. William Rigby.

LIST OF SEALED PATENTS.

Sealed March 27, 1857.

2264. John Boyd.
2266. William Smith and Nathaniel Fortescue Taylor.
2270. John Rothwell.
2274. Charles John Carr.

2278. David Thom and George Aldcroft Phillips.
2280. John Lord.
2283. Charles William Ramié.
2289. Duncan Bruce.
2296. Henry Naylor and James Crabtree.
2300. Charles Durand Gardissal.
2344. William Wilkinson.
2380. William Rennie, jun.
2442. Robert Hanham Collyer.
2456. Joseph Lacassagne and Rodolphe Thiers.
2474. George Thomson.
2560. Francis Cook Matthews.
78. Robert Smith.
98. George Fergusson Wilson.
112. John Barsham.
164. Frederick Crace Calvert.
210. George Fergusson Wilson.
212. George Fergusson Wilson.
248. Thomas Cooke.
276. Alexander Wright.
304. Matthew Andrew Muir and James McIlwham.

Sealed March 31, 1857.

2307. Joseph Renshaw.
2308. Victor Renault.
2309. Daniel Desmond.
2311. Robert Edmeston.
2312. Charles Goodyear.
2313. Michael Thomas Crofton.
2335. Andrew Dunlop.
2349. William Marriott and David Sugden.
2369. Joseph Bennett Howell.
2405. Thomas Allen.
2425. Peter Armand Lecomte de Fontainemoreau.
2426. Peter Armand Lecomte de Fontainemoreau.
2427. William Dray.
2437. Samuel Cunliffe Lister and William Tongue.
2438. James Robert France.
2440. William Palmer, jun.
2487. John Christian Bremer.
2495. Edwin Allan Athawes.
2504. Louis Auguste Mangin.
2523. Michel Dognin.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris: Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

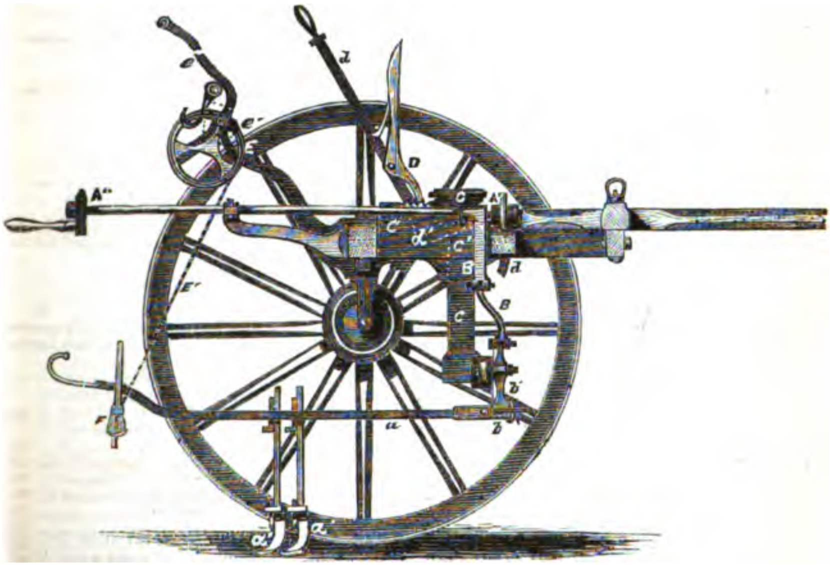
Mechanics' Magazine.

No. 1757.] SATURDAY, APRIL 11, 1857. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

PRIEST AND WOOLNOUGH'S PATENT HORSE HOES.

Fig. 2.



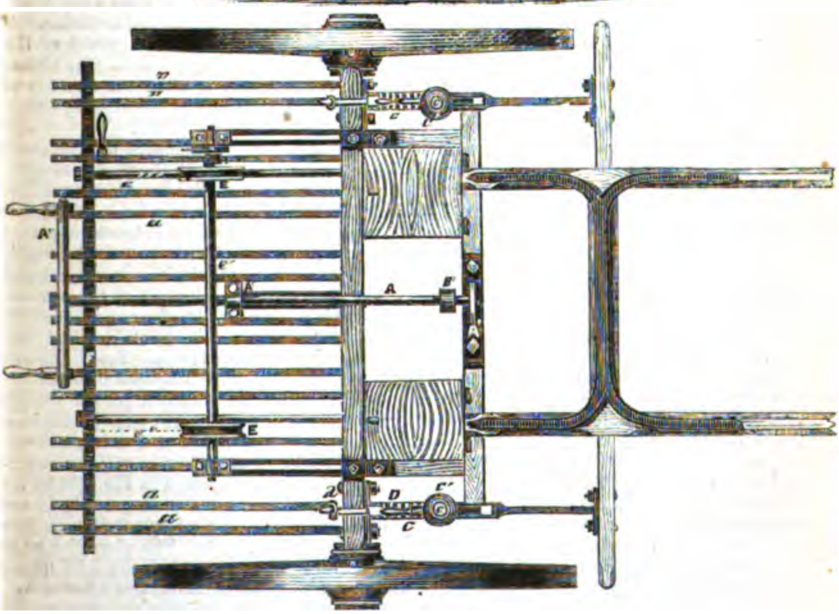


Fig. 1.

PRIEST AND WOOLNOUGH'S PATENT HORSE HOES.

MESSRS. PRIEST and WOOLNOUGH, of the Iron Works, Kingston-on-Thames, have improved the construction of horse hoes made with hoes or cutting parts affixed to stalks and levers rising and falling independently of each other, by arranging the bar which carries the hoe lever so that its distance from the land can be adjusted while the hoe is travelling; first, to set the hoes in a more or less oblique position, as the hardness of the ground or nature of the work may render necessary; and, secondly, to admit of either one or both ends of the bar being raised or depressed at pleasure, so that sloping ground or side hills may be hoed with equal precision in depth as flat. For this purpose the axes or standards, to which the ends of the bar are attached, are capable of being moved up or down in the frame at either end, by suitable lifting apparatus.

Fig. 1 of the engravings on the preceding page shows a plan, and fig. 2 a tranverse section of a horse hoe constructed with the improvements. *a*, *a*, are the hoe levers, to which the stems or stalks, which carry the hoes or cutters *a' a'*, are attached. The levers *a* are connected to and move on pin joints carried by the bar *b*. *b'*, *b'*, are arms on the bar *b*, upon which friction rollers are mounted, and are supported in boxes formed at the lower ends of the vertical axes or standards *c*, *c*; one of the arms *b'* is connected by a link B to the lever arm B', fixed on the horizontal axis A, supported in bearings A'. Fixed to the framing A'' are lever arms on the end of the axis A, by which the bar A' and hoe levers may be moved from side to side, in order to adjust the hoes to the rows of crop, without altering the depth of the hoes or cutting parts on either side. The vertical axes *c*, *c*, are supported, and are capable of moving up and down in the sockets *c' c'* fixed to the framing of the machine, and when it is desired to raise or lower the bar *b*, to which the hoe levers are connected, it is accomplished in the following manner:—*d*, *d*, are levers, moving on fulcrums *d'*, carried by the parts C of the sockets *c'*; the curved ends of the levers *d*, *d*, pass through slots formed in the vertical axes or supports *c*, *c*, and when the levers *d*, *d*, are pulled downwards, the curved ends of the levers act against friction rollers carried by the vertical axes or supports *c*, *c*, and thus raise these axes in their sockets *c' c'*, and they are retained in any desired position by the spring pauls D, D, which take into the ratchet teeth formed on the parts C, C, of the sockets *c'*. Thus it will be seen that the bar *b* may be raised or lowered whilst the hoe is travelling in order to adjust the hoes or cutting parts; and also that either end of the bar *b* may be raised or lowered independently of the other, so as to adjust the hoes to penetrate a uniform depth, on hilly ground, side hills, &c. *e* is a lever fixed on the cross axis *e'*, upon which excentrics E are fixed, and chains E' are attached at one end to the excentrics E, and at their outer ends to the bar F, upon which the ends of the hoe levers *a* rest, and by this means they may be raised completely off the land.

ON ENGRAVING BY LIGHT AND ELECTRICITY.

A very interesting lecture, "On the Application of Light and Electricity to the production of Engravings—Photogalvanography," was recently read at the Royal Institution, by Thomas A. Malone, F.C.S., Director of the Laboratory in the London Institution. The subject is one with which the speaker has been for some years practically acquainted. In 1844, he experimented for many months upon the engraving process of M. Fizeau, of Paris, in conjunction with M. Claudet and M. Fizeau. Since that time he has closely watched all the steps of improvement that have been taken, down to the latest investigations of Talbot, Niepce de St. Victor, Pretsch, and Poitevin. The following is a report of the lecture:

The methods devised for the accomplishment of the certain perpetuation and cheap multiplication—by means of printer's ink and the ordinary printing presses—of the images of natural objects, as obtained in the camera obscura by the processes of ordinary photography, may be arranged under three great divisions.

The *first* method, in which light was used to aid the engraver's art, was almost coeval with the first attempts made to produce sun-drawn pictures. Indeed, it had been asserted* that photography and photographic engraving were invented between the years 1813 and 1827, by one man, Nicéphore Niepce, of Chalone on the Saône. A reference, however, to the Journal of the Royal Institution† would show that photography really sprang from the labours of Thomas Wedgwood and Humphrey Davy, as far back as the year 1802.

Although we cannot accord to Nicéphore Niepce the merit of originating photography, we must give him the undivided title of founder of the art of photographic engraving, and, moreover, acknowledge that he was the first to fix not only a *direct positive* photograph, but also to secure on metal and glass plates the images of the camera, and this long before Daguerre produced his wonderful plates. Niepce's method was beautifully simple. He took Jew's pitch or asphaltum, and upon it poured oil of lavender to resolve the bitumen into a varnish with which he could coat plates of metal or glass. A plate, coated and dried, was exposed to the light with an engraving superimposed, or it was placed in the field of the camera obscura, and a photographic image was obtained on the varnished plate. This image was *not visible*. The plate had to be submitted to the solvent action of a mixed liquid, composed of one part of oil of lavender and ten parts, by measure, of *white oil*

* By a correspondent in the *Mechanics' Magazine*, vol. lxv., pp. 277 and 326.

† Journal of the Royal Institution, vol. i. p. 170.

of petroleum, or mineral naphtha. On immersion in this fluid, wherever the light acted, the varnish became insoluble, and in a certain degree proportionately so to the intensity of the light. There were not only lights and shadows, but half tints. The picture, as soon as developed by the solvent, was removed, drained, and washed with water to check all further action. The shadows of the picture were now represented by the parts of the white metal or glass plate laid bare; the lights were given by the film of varnish which the light had hardened, and the solvent had left untouched. The plate, now finished, was capable of being etched by simply pouring engraver's acid upon its surface. The varnish would protect the metal over the lights of the picture; while the shadows, the bare metal, would be bitten in. On removing the varnish, the plate could be inked and printed from. Such are the essential details of the first of the photographic engraving processes. The specimens on the table of the Institution were presented in 1827 to Mr. Bauer, late of Kew, by Nicéphore Niepce, who for a short time resided at Kew, on a visit to a brother in infirm health. Niepce prepared a statement regarding his invention, for presentation to the Royal Society; but as he at that time kept his process secret, his manuscript was not published. Niepce appears to have returned to France, disappointed at his ill fortune.*

Niepce's bitumen process was improved by his nephew, M. Niepce de St. Victor, who has published a treatise† on it, giving the necessary minute instructions. The main features do not differ from those above given, though greater sensitiveness and perfection have been obtained. The process is still under trial; but the difficulties of obtaining a constantly uniform result at present stand in the way of its general adoption. It still deserves a thorough investigation.

The *second* method of producing photographic engravings is founded upon certain properties possessed by the Daguerrean image. It is found that a daguerreotype, unfixed by gold, is acted upon by nitric acid in its shadows, while the lights long resist the biting action of the acid. An etching is obtained by merely leaving diluted nitric acid in contact with the plate. The etched plate is then inked and printed from, as in Niepce's case. Dr. Donné, of Paris, appears to have been the first to devise this method; but the action is not easily controlled, and the process has fallen into disuse. In 1842, Mr. Grove published in the *Philosophical Magazine* a method by which Daguerre's images can be engraved by the chlorine evolved by voltaic action, when the daguerreotype plate is made the positive terminal of the battery, and immersed in diluted hydrochloric acid; the negative wire being terminated by a plate of platinum, which was placed opposite and parallel to the photographic image. This process is much more under control than the last, and is also worthy of further investigation. Here the image is truly drawn by light and *engraved by electricity*.

M. Fizeau, about the year 1844, also patented in this country, in conjunction with M. Claudet, a process for engraving the daguerreotype image. The speaker was instructed in this process by M. Fizeau, and worked for many months at its perfection. Results obtained both in France and England showed that in cases where great delicacy of delineation was required, as in certain anatomical subjects, this process had not been surpassed. It quite justified the formation of a second division of the available photographic engraving processes.

M. Fizeau, like Mr. Grove, availed himself of the affinity of chlorine for silver, but relied on chemical action for its application. He (M. Fizeau) made a solution of common salt and nitrite of potash in water, to which he added nitric acid. This mixed acid acted immediately when aided by warmth, upon the silver of Daguerre's plate, and left untouched the parts supposed to be completely covered by mercury. Chloride of silver was thus at once formed in the shadows of the images, and after some time in the half tints also. A very faint etching was thus produced. A prolonged application of the acid would not further deepen the etching, since the insoluble chloride of silver at first formed protected the faintly-etched parts from a further deepening corrosion. It was therefore necessary to remove the chloride of silver by washing with a solution of ammonia. This effected, the plate was ready for a second application of the acid; and by this alternation of solutions, the etching was increased in depth. But it was found that after a few applications of the acid the lights of the image also gave way. To remedy this was M. Fizeau's great aim; and he succeeded by heating the etched plate in a strong and boiling solution of caustic potash; after this the lights resisted the acid's action. The heating in potash is an important feature in M. Fizeau's process. As soon as the etching has been carried as far as possible by the acid mix-

* The statement made by our correspondent, Dr. Lotsky, upon this subject, in the passage referred to in a preceding note, is thus confirmed.

† Traité Pratique de Gravure Héliographique, par M. Niepce de Saint-Victor. Paris, Juin, 1856.

ture, the plate is dried and inked with fine printer's ink, and an impression may be immediately taken; but M. Fizeau prefers that the ink should be allowed to dry in the hollows of the plate, and gold deposited upon the bright parts by the electrotype process. On now removing the ink, ordinary diluted nitric acid may be safely applied to deepen still more the shadows. This last step causes M. Fizeau's etchings to possess greater vigour than those obtained by Donné's or Grove's processes. M. Fizeau, foreseeing that the wear and tear of the silver plates might be considerable, thought to use the electrotype process to produce fac-similes of the engraved plates, reserving the original plate unworn to supply any further demands. The patent right in this process will soon expire.

The processes of the *third* and last division were, it must be confessed, very desirable, notwithstanding the numerous satisfactory specimens obtained, and still to be obtained, by the processes previously described. The truth seemed to be that none of the processes gave uniformly satisfactory results: hence the necessity of being acquainted with the capabilities of all the chief known methods, and of impartially comparing them with a view to produce any special required result.

Mr. Henry Fox Talbot opens the third division by his gelatine and bichromate of potash process, in which a steel plate is covered with a liquified jelly, containing bichromate of potash in solution. This jelly is allowed to dry upon the plate, and the gelatined plate may be used to reproduce engravings or the images of the camera; the light, as in Niepce's case, altering and hardening the gelatine whenever it fell with sufficient intensity. Nitric acid acts so energetically and so uncertainly on the steel plate, that but little success would attend its employment. Accordingly, Mr. Talbot was led to seek a better engraving liquid. This was found in a solution of bichloride of platinum, which appeared to act in the desired manner. The advantage of any process on steel plates would be obvious from the great number of impressions that so hard a body would yield under the wearing action of the printing press. It might here be observed that the bitumen process had also been applied to steel plates by M. Mante, in a series of natural history plates, published in Paris, and also by M. Niepce de St. Victor, in the frontispiece to his treatise.

In 1854, Herr Paul Pretsch, of the Imperial printing office of Vienna, patented in this country, and subsequently in France, a process which he has called *Photogalvanography*. He uses Mr. Talbot's materials, but with certain additions, and avails himself of a property of the gelatine which allows of his dispensing with the acid etching altogether. This process was described by the lecturer in terms substantially the same as those employed in the description given at page 415 of the sixty-fourth volume of the *Mechanics' Magazine*.

In all the engraving processes hitherto described, there is a difficulty in obtaining a granular surface over the etched parts necessary to hold the amount of ink required by the printer. In Pretsch's process this difficulty remarkably enough does not present itself; the swelled surface breaks up in a direction vertical to its surface into little masses, which are just what is desired; this result is quite characteristic. It has been attributed to the presence of particles of chromate of silver, or of iodide of silver. Would it be too far-fetched to suppose that it is another beautiful instance of the slaty cleavage action demonstrated by Dr. Tyndall?* However this may be, the fact is very important for the success of the invention. The chemistry of the processes of the first and third divisions of this subject is but little advanced.

M. Poitevin, of Paris, has applied the gelatine and bichromate of potash process to lithographic stone, and his results would well bear a comparison with those obtained by the other methods described in this division.

The speaker, in conclusion, expressed his opinion that these engraving processes would greatly advance the art of photography itself, particularly in its applications to the delineation of coloured objects, in which it is still very imperfect, although some progress has been made.

EXHIBITION OF INVENTIONS AT THE SOCIETY OF ARTS.

(*Continued from page* 321.)

40. *Patent Locomotive Engine.* Sharp, Stewart, and Co., Atlas Works, Manchester.

The improvements shown are applicable to every kind of locomotive engine, and interfere with no arrangement yet introduced for burning coal or any other fuel. They consist, first, in dispensing with the usual slide bars and slide blocks—the piston rods being longer than usual, and their outer ends supported by bushes, which are bolted to the cross bracket. The inner ends are supported by the stuffing boxes of the cylinders as usual. On the middle of each piston rod is fixed a cross-head, which communicates motion to the driving axle, by means of the connecting rod. This arrangement has several advantages. The second part of the invention consists of an improved arrangement of pumps for supplying water to the boiler. The ordinary pumps are dispensed

* We hope to give an account of Dr. Tyndall's sagacious theory in an early number.—Ed. M. M.

with, and when the engine is in motion, if the pump rod be disconnected from the eccentric, no part of the machinery for pumping is at work, and the engine is relieved from the friction and wear and tear of the pump rams. The third improvement consists of an apparatus for superheating or drying the steam before it is taken to the cylinders. The last part consists in making the stay bars of the upper part, or roof, of the inner fire box of rolled iron or of bent plate iron.

41. *Locomotive Engine and Tender;* T. R. Crampton, C.E., Buckingham-street, Adelphi.

This model illustrates the principle of a low centre of gravity, as applied by Mr. Crampton in the construction of locomotives.

42. *Composite Passenger Carriage;* J. V. Gooch. Drawn by William Tijou.

This carriage was designed for the Eastern Counties Railway.

43. *The Railway Postman;* A. D. Lacy, Knayton, Thirsk, Yorkshire.

See *Mechanics' Magazine,* Vol. lxv., No. 1733, p. 385.

44. *Patent Apparatus for signalling between the Guards and Drivers of Railway Trains:* Lot Wilks, 18, Bedford-row.

This consists of an arrangement of air chambers, with pistons working in them, fixed in the carriages and the guard's van.

45. *Patent Railway Chair;* Munslow and Wallwork, Miles Platting, near Manchester.

This invention consists of a method of restoring the proper position of the rail (when that part of the chair upon which it beds shall have become worn) by means of loose pieces.

46. *Z-Rail for Permanent Way;* E. E. Allen, Bucklersbury.

The rail is supported by longitudinal projecting plates, or wings, one on each side of it; these wings being in different planes on the two sides, that is, the projecting plate on one side is near the upper part of the rail, and the projecting plate on the other side is near the lower part of the rail. Fig. 1 of the annexed engravings represents such

Fig. 3.

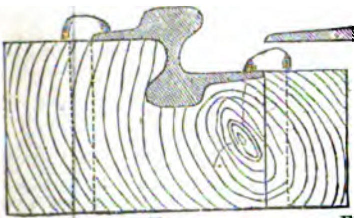


Fig. 1.

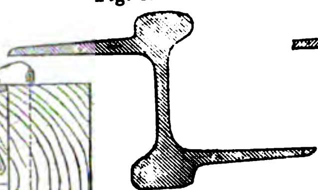


Fig. 2.

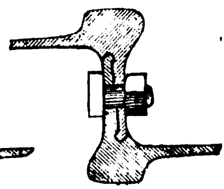
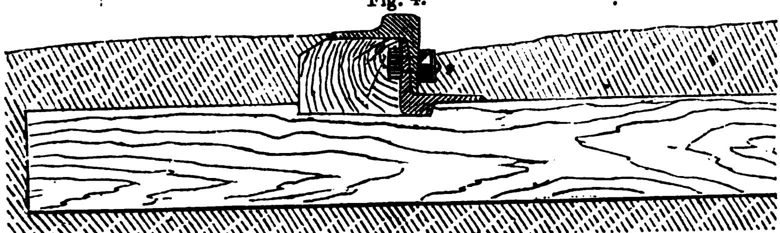


Fig. 4.



a rail; fig. 2, a similar one in two parts; fig. 3, the rail combined with a longitudinal sleeper; and fig. 4, the rail combined with a transverse and longitudinal sleeper, and suitably packed.

47. *Patent Double Rails;* Thomas Symonds, Flushing, Cornwall.

These rails are particularly intended for goods and mineral transport; the base for the tread of the wheels is extended. Two rails are placed side by side, and the wheels of the engine are made of sufficient width in the tread to cover the breadth of both rails. The string of wood between the two rails acts as a continuous fish, to give elasticity, and overcome the rigid effect which is destructive to rails and the rolling load thereon.

48. *Models showing the Modes of laying Flush Rails in Streets or Highways, so as not to interfere with other Traffic;* W. Bridges Adams, Adelphi.

These are examples of Mr. Adams' ingenious proposals for using up old railway rails, as described at page 181, of *Mechanics' Magazine,* No. 1750.

49. *Rail for Street Purposes;* William Tijou, Locomotive Department, Eastern Counties Railway.

This is a hollow-faced cast-iron rail, in which the wheels of ordinary vehicles are intended to run.

50. *Patent Vice-Jaw Chairs;* Thomas Wright and Co., 9, George-yard, Lombard-street.

The vice-jaw chairs are applied to wooden sleepers, the rail resting on the bottom of the chair, being firmly sustained on both sides of its channels by the jaws of the chair, and in lieu of the wooden key the vice-jaw is placed, and secured between the channel of the rail and the inside jaw of the chair. The vice-jaw is completely dove-tailed, thereby preventing lateral action. The fastening passes under the rail and through the chair.

51. *Patent Bedplate Solid Sleepers and Rails for Streets and Roads;* Thomas Wright and Co., 9, George-yard, Lombard-street.

These comprise a double grooved combined solid

rail and sleeper, adapted for metropolitan streets, &c., and it is proposed to lay them down flush with the surface. The sleeper and rail are combined in one solid piece of iron, and are blocked in with the paving stones.

53. *Patent Collapsing Head for Carriages, invisible when not in use;* James Rock, jun., Hastings.

This invention is one of the many useful improvements introduced into the construction of carriages by Mr. Rock, of Hastings. It is intended to supply a ready means of converting an ordinary open carriage into a close one, on the instant, in case of sudden rain or cold, without imparting a heavy appearance to the carriage in its usual form. The patent collapsing head is applicable to all kinds of open carriages, either by itself forming a covering for two or four persons as required, or in addition to the common half-head. In the latter case it is used to make the carriage close for four persons, and when not wanted as a covering, serves, both in use and appearance, for the usual folding knee-flap. The models show the application of this invention to a barouche and to a dog-cart or phaeton.

55. *Carriage Wheel Nave;* G. G. Stokes, Sevenoaks.

This consists of a nave, in which the use of a linchpin, outer nut, or screws on the inside to keep the wheel on, is dispensed with, and all is clear and compact.

56. *Patent India-Rubber Wheel Tyres;* W. C. Fuller, 2, Bucklersbury.

The improvement in these tyres consists in the combination of canvass or other fibrous materials with the India rubber in such a manner as to prevent its elongation and consequent liability to become displaced when in use.

64. *Improvements in the Surface Ornaments of Carriage Panels;* Hooper and Co., 28, Haymarket.

This specimen shows a further improvement in this kind of manufacture, representing interlaced *cane-work*, the first importation of panels worked to represent interlaced crochet-work, having been made by Hooper and Co., during the Paris Exhibition of 1855. In those, the appearance of interlacing was only horizontal; in this specimen it is also perpendicular, with cross interlacings at an angle of 45° right and left.

65. *Patent "Versabilis" Perambulator;* James Clifton, 541, New Oxford-street.

By this invention facility of motion is given to the fore wheel, which allows the carriage to be turned round, or aside, without bearing up the front.

67. *Improvements for Ventilating Mines, &c.;* George Heppell, Uttoxeter.

In this invention it is proposed that a furnace be placed at the surface, within a shaft or chimney, leading from the top of the upcast shaft instead of at the bottom, as is usually done. This chimney to be of a greater area, leaving a space from 12 to 18 inches open on three sides of the furnace, so that the air from the workings passing up the upcast shaft comes under and around the furnace; by which plan a greater amount of rarefaction takes place, so that the power is considerably increased. The furnace grate to be not less than 50 to 60 feet area, except in cases where the workings are limited. As an auxiliary to the furnace, the inventor proposes a new plan of cage ventilation, to the power of which he considers there is no limit. He proposes to make the shaft or shafts air-tight, and to make the cage used for the transit of mineral to fit the same. In the top of the cage he proposes to place a valve, fitted with a balance-weight. A hole to be made in the bottom of the cage as large as possible. At the bottom of the shaft within the headway, he places a valve or door, also fitted with a balance-weight. On the cage ascending, the valve or door in the headway will shut in behind it. The valve on the top of the cage being open allows the air freely to pass throught it. The shaft is filled with air from the surface, so that on the cage descending, a body of air is forced into the working at the rate of 12 to 14 miles per hour, or more if required.

71. *Patent Apparatus for Manufacturing Coal Gas;* Wm. Basford, 19, Arundel-street, Strand.

The object of this invention is to produce and purify coal gas without making either tar or other ammoniacal liquor, preventing thereby the nuisance of gas-works as at present constituted. The apparatus consists of an oblong chest formed into two compartments, placed one over the other, the upper one being charged with charcoal prepared under one of Basford's patents, and heated. The lower compartment receives the crude gas as it comes from the retort, from whence it ascends through the heated charcoal into the upper chamber, and passes off through the top directly into the holder, when it is ready for use.

72. *Pavilion Gas Works, adapted for using his Patent Process in Parks and Pleasure-grounds;* Wm. Basford.

This style of building is designed for the purpose of removing the objection to the unsightly buildings now in use for gas-works.

73. *Preserved Coal and Coke;* H. W. Wood, Briton Ferry, near Neath.

These blocks are made from fresh cut small coal of known quality, which is first dried and heated. It then receives an addition of pitch in proportions to suit the nature of the coal employed in the manufacture. The small coal and pitch are then more perfectly mixed by means of a common pug mill, and when the amalgamation is complete it is turned out into an iron mould, and pressed off in the usual way. The object is to preserve coal or coke from the loss arising from decomposition, exposure to tropical rains, &c. It is made impervious to wet, and capable of exposure without injury; it is subjected to no change, whether kept in store or upon an open sea beach, and not liable to spontaneous combustion.

74. *Patent Anti-friction Top Rollers;* Evan Leigh, Miles Platting, near Manchester.

This improved roller has its bearing or journal inside; the oil is conveyed down a groove from which the journal can draw its supply as from a fountain. Instead of oiling it three or four times a day, as in the old plan, about once a week suffices. Instead of oiling the weighting hooks and end pivot in three or four places, all is done in one place. Instead of the wear being thrown upon pivots, cup, bars, and weighting hooks, it is thrown upon the internal journal, which being of cast iron, working on a cast-iron spindle, possesses considerable durability.

76. *Steam Dash Wheel;* J. Wallace, jun.

By this invention the ordinary dash wheel of the manufacturer and bleacher is converted into a complete bleaching establishment, all the operations, aided by the direct effect of steam, being performed at once within the wheel's case.

77. *Rotatory Beetle;* T. R. Bridson.

In the ordinary system of "beetling," or the mechanical finishing of woven goods, by a direct percussive squeeze upon the fibres of the cloth, the effect is produced by an arrangement of cam hammers, which strike the cloth so as to work up the threads to the required degree of finish. The inventor of the remarkably successful "Stenter"

finishing machine has here substituted a purely rotatory motion for this reciprocating hammering.

79. *Steam Hammer, with Improved Valve Gearing ;* W. Naylor.

See *Mechanics' Magazine*, No. 1752, page 217.

80. *Mechanical Hammer of Frictional Action ;* W. Eassie, Gloucester.

Here the hammer block is raised by a pair of nipping pulleys, which embrace the hammer rod or bar. The chief novelty in the arrangement is the action of the oscillating frame on the centre studs, by which the frictional rollers are made to nip the hammer rod respectively above and below the centres of those studs.

81. *Patent Band Saw* ; Moses Eadon and Sons, Sheffield.

The leading feature of this invention is, that it is manufactured without any joint, and is consequently tempered evenly throughout. It works over two pulleys driven by steam power as a band, and is most valuable in cutting curves and bends, such as have heretofore been cut by the hand and with the ordinary turning web.

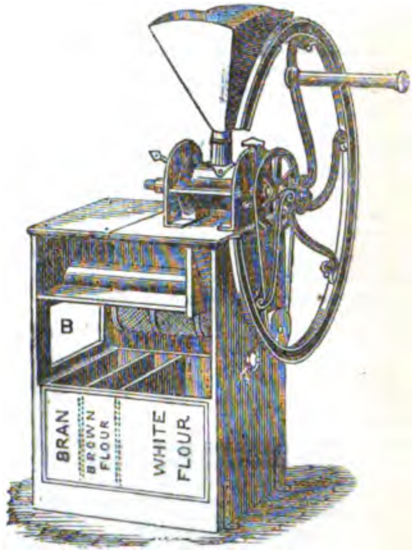
82. *Patent Dowel Box for Hand Rails, Sashes, &c. ;* J. J. Victory, Henrietta-street.

This invention consists of an improved clamp and guide for holding the wood firmly in its place, and for accurately directing the bit into the end of the wood. The sides of the clamp are capable of being shifted to receive different-sized pieces of wood, by means of a right and left-handed screw, tapped through corresponding nuts in the sides.

(*To be continued.*)

WHITE'S DOMESTIC CORN MILLS.

Public attention has frequently been called of late to the fact that the ordinary white bread made from fine flour is much less nutritious than bread made from the whole meal of ground corn; and the late Professor Johnston, Dr. Letheby, Dr. Carpenter, and others have endeavoured to impress us with the importance of the circumstance. We have much pleasure, therefore, in calling attention to an effort which has been made by Mr. White, of High Holborn, London, to afford families facilities for profiting by the suggestions of these gentlemen. Mr. White has undertaken the manufacture of small portable corn mill and dressing machines, by the use of which a family may obtain from grain a pure white flour for pastry and fancy bread, and a coarser meal for ordinary use, at an expense very much below the present cost of less nutritive materials. We have had several kinds of the improved mills submitted to us, and have selected one for illustration. The engraving shows a best London steel mill for grinding wheat and dressing the flour at one operation. The space required to work this mill is 5 feet square, the mill and machine being 3 feet by 1 foot 6 inches, when the fly-wheel is taken off. The cut shows how the cylinder can be removed by opening the door at the end of the machine, and taking the cylinder out, after removing the brass screw at the other end. White's mills are the only ones that have such convenience for cleaning the cylinder, which should always be brushed before leaving the mill, should it not be



required to be used for some time. Wheat at times is sufficiently damp to clog the wire; in such case the cylinder should be brushed after every peck, to prevent loss of flour in the bran. This mill, when in proper condition, is said to produce 10 lbs. of white flour, 6½ lbs. of brown flour, and 3½ lbs. of bran from 20 lbs. of wheat.

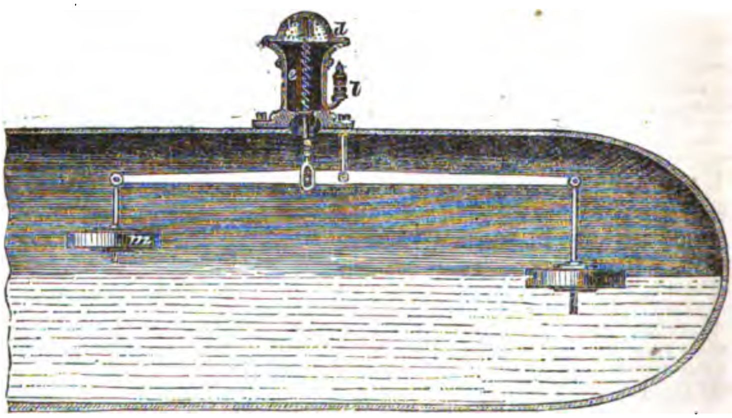
NEW MACHINERY FOR MAKING ENVELOPES.

Mr. J. Keith, of Eltham, Kent, has patented an improved set of machinery (the invention of a foreigner) for manufacturing envelopes. The paper blank is fed into this machinery by hand, and creased by the descent of a plunger into the creasing box, as usual. A partial exhaustion is then effected under the paper, to hold it in the box while the plunger rises. The box is then traversed forward along guides under a second plunger of peculiar construction, for folding over the flaps or lappets of the blanks, and pressing them down previous to discharging the finished envelope from the machine. As the crease blank is carried forward with its flaps standing vertically, or nearly so, out of the box, the end flaps meet yielding projections which turn the flaps inwards, and thus bring them under the second plunger. This plunger consists

of a hollow rectangular frame, fitted with sliding pieces which act in consecutive order, first turning inwards the forward side flap while the creased blank is moving into position, and then laying the end flaps over it. A pendent curved spring, which is caused to advance slightly by the pressure of the descending plunger turns over the fourth flap, and the plunger, pushing aside the projections which turned in the end flaps, then comes down on the envelope, to give it the final pressure. Before this takes place, the exhaustion below the envelope is removed. The plunger is also provided with an exhaust arrangement, by means of which the plunger, when rising, is enabled to draw up the envelope out of the box. The box then returns to be fed by a fresh blank, and the exhaust being cut off immediately the box has passed away, the envelope is then free to fall by its own gravity out of the machine.

YORK'S INDICATOR FOR STEAM BOILERS.

This invention consists of an improved safety valve and low water, or high and low water indicator for steam boilers, as represented in the engraving. It has been patented by Mr. T. York, of Wolverhampton. *a* is a valve seat on the top of the boiler, upon which the valve, *b*, is pressed by the helical spring, *c*, the upper end of which bears against a shoulder on the dome, *d*, covering the box, *e*, in which the valve is contained. The dome, *d*, is perforated, as represented. A float, *f*, is suspended in the interior of the boiler from the end of a lever, *g*. A rod, *h*, jointed to the under



side of the valve, *b*, is connected with the lever, *g*, by means of the slot, *i*, in which the pin, *k*, of the lever, *g*, engages, so that the lever, *g*, has play within certain limits without affecting the valve; but when the water and float, *f*, descend below the proper level, the lever, *g*, raises the valve, *b*, and permits of the discharge of the steam. As the steam escapes between the valve and valve seat, a portion of it is discharged into the whistle, *l*, and thereby gives notice to the engine-man that the water in the boiler is too low. The valve, *b*, acts as a safety valve when the water is at ordinary level, and rises whenever the pressure of the steam exceeds the pressure of the spring upon it.

A second float, *m*, is attached to the other end of the lever, *g*, as represented. If the water in the boiler rises too high, the float, *m*, becomes immersed, and raising the end of the lever, *g*, to which it is attached, lifts the valve, *b*, and the discharge of the steam and sound of the whistle, *l*, call the attention of the engineman. The valve, *b*, thus acts as a safety valve and high and low water indicator.

CREAM OF TARTAR AND TARTARIC ACID.

It will be highly satisfactory to dyers and others engaged in the various manufactures where the above valuable products of vinous fermentation are used, to learn that one of our continental neighbours has recently discovered and patented a method of producing a liquid tartar, identical in its taste, power, and properties with tartaric acid, having double the power of cream of tartar, and which can be supplied in any quantity, however large, at one half the price of tartaric acid. The disease which, for some years past, has affected the vines in the wine countries, by reducing the quantity of wine produced, has greatly enhanced the price of cream of tartar and acid, and also rendered it scarce; the introduction of the patent tartar into the market is therefore most opportune, especially as the proprietors of the patent, Messrs. Bonney and Co., 130, Fleet-street, have determined to supply it at half the price of tartaric acid.

A SUBSTITUTE FOR SILKWORMS.

Silk will, ere long, in all probability, be derived not from the worm, but from the leaf on which it has hitherto existed. It is now not the breeding of the insect but of the mulberry tree—that species which was its only food, and which from that circumstance gave the *savant* the cue that led to his making the intimated discovery. His name has not yet been announced, although we should imagine it was Signor Lotteri, who, in the course of last year, fully ascertained that a silky substance could be procured from the bark of the mulberry tree, and that by maceration good silk, and paper also, could be easily prepared therefrom. The *savant* in question, ruminating, it is said, on the circumstance of the silkworm living on one description of food, came to the conclusion that "the silky substance must lie not in the animal, but in the vegetable matter" which supported it. He therefore "analysed the composition of the mulberry leaf, and, by boiling it to a thick paste, produced every description of silk in immense quantities."—*Sydney Empire.*

THE CONSERVATION OF FORCE.

To the Editor of the Mechanics' Magazine.

Sir,—It may, and perhaps justly, be deemed great presumption in me, to intrude myself into the discussion of a subject which even Professor Faraday does not approach without apology. And this presumption will, no doubt, appear still greater when it is perceived that the remarks I have to offer are opposed to his exposition of this subject, and that my criticism is adverse to his late lecture. There are several considerations which I might put forward in apology, but I think it will be sufficient to say, that as you, Sir, the Editor of the *Mechanics' Magazine*, have addressed to *mechanics* papers on scientific subjects which are as difficult to treat and as difficult to understand as any of the branches of Physical Science, you will perhaps go a step further, and permit me to say a few words on a subject somewhat more abstruse than any upon which I have hitherto ventured. The little I have been able to learn of the labours of this eminent man has taught me to hold him in respect, and I will endeavour in expressing my dissent from some of his opinions to imitate the modesty which his own writings seem to exemplify.

Allow me to say, in starting, that it appears to me that the terms force, momentum, inertia are not always used by him in the same strict sense as they bear in the writings of mathematicians. I shall, therefore, be in some danger of misunderstanding their import, of misapprehending the exact meaning which they were intended to convey, and of taking unnecessary pains to combat opinions which Professor Faraday does not hold, and never intended to advance.

The principle of the "Conservation of Force" seems sometimes to be treated by him as a truth established by *à priori* proof, and sometimes as resulting from experience; and care is not taken either clearly to set forth the sense in which the term *force* is used, or to give arguments for, or evidence of, its conservation. I think, therefore, I may claim pardon if I misconceive the law as the author understands it, and if I doubt its truth.

If the word force be employed as the mathematician employs it—to denote the cause of which change of motion, or tendency to change of motion is the effect, then I have no doubt that the principle is incorrect. I see no sufficient reason at present to believe, that the sum total of this kind of force existing in the universe is constant. Nor do I think there are sufficient reasons to believe that the physical attraction which a body is capable of exercising, or the resistance it can offer, has equivalents into which it is convertible, at the expense of which it is augmented, and in favour of which it is diminished. Professor Faraday's idea appears to be that every collected mass of material has a number of active virtues—virtues of magnetism—virtues of electricity—virtues of heat—virtues of light—virtues of internal cohesion or repulsion—virtues of gravitation, &c., the sum total of which is invariable; so that if any one or more be increased, this growth is compensated by an equivalent diminution of the others, and if any one or more of their properties be on the other hand diminished, it is because its strength or power is required by its copartners. If the body is not performing one operation, it is performing another equivalent to it. Thus, when the gravitating force of two bodies is increased or diminished by their mutual approach or separation, he expects the change in this force to be accounted for by the cessation of some other work upon which the energies of the two bodies were previously employed. If this be not a precise account of the views I desire to state, it will not be far from the mark, if, instead of "every mass of matter," we write "every heavenly body." Taking this idea of the conservation of force as correct, objections are raised against the ordinary idea of the force of gravity, and of the mode in which it is supposed to act. These objections are three:—1st. It sup-

poses the attraction of gravitation to act directly and without medium between two bodies across an intervening and empty space—a mode of action inconceivable to Faraday; 2nd. It does not recognise the principle of conservation, but, 3rd. By supposing the force to *vary* inversely as the square of the distance, directly opposes it. Here, I think, Professor Faraday is unfair, both to that which he advocates and to that which he combats. If his principles be true, it is unreasonable to expect every definition and every proposition in mechanics to embody an express recognition or statement of it. One might just as well expect to find in a definition of force a full exposition of the parallelogram of velocities, and of the laws of motion. It is not just to the conservation principle, to say that the statement given of the idea of gravity contradicts it. If this were so, the best thing to be done would be to throw away such a principle at once; for the so-called definition of gravity is hardly anything more than a statement of ascertained facts, and if these contradict it, the principle is undoubtedly false. But it is not so. The principle might be a correct one, and the motion of gravity not require modification. So far as I can see, there might be immediate action at a distance, and still, in some sense, conservation of force. The force of gravity might vary inversely as the square of the distance, and there might still be conservation of force in general. We can conceive of gravity, as one of many manifestations of a larger agency, whose operation, as a whole, may be constant, and yet regard this particular mode of its action as we do now. And if we ever discover that Faraday's ideas have their counterpart in fact, mathematicians will still find it convenient to give this single manifestation of the imagined wider principle, a distinct name, and to state its laws in a separate form, and doubtless will continue to do so. And there is no reason at present apparent, why the name and the laws, so valuable and so necessary, should not remain what they are. Indeed, I cannot help thinking it would be impossible to change them.

The method of induction is turned topsy turvy when we test discoveries already made, by others of the proofs of which we are still in search. Yet this seems to be the way in which our notions of gravity are treated in the lecture. It is, however, as I have already said, unfair to the hypothesis started, for its establishment does not require the subversion, nor possibly even the modification of the received idea of the force and law of gravitation. It is *possible* it may be discovered to be only one member of a large family of forces, just as heat and light have their relatives in electricity, magnetism, and chemical action. But we should not quarrel with our present acquaintance, because he has not yet revealed to us his family name, or introduced us to his brethren. We had better, too, be thankful for our present knowledge, and wait patiently till we know more before we give a name to a supposed class of facts from our experience of a single individual.

It is said, there is a difficulty in conceiving *how* the attraction between two bodies can grow so fast, simply in consequence of their approach. Does Dr. Faraday suppose that any theory can be constructed, or any hypothesis framed, which shall dispense with that *How?* Let us look at the hint of a theory which he gives. He supposes a medium pervading all matter and all space, by and through which medium the various bodies in space hold communion with each other. The same relation which one body keeps up with another would be kept up with the medium even if the second body were absent. This relation, too, is sustained in radial lines, just as rays of heat and light proceed from a central source. And as in the case of heat and light the amount of heat or light received on a surface varies inversely as the square of the distance from the centre, so the gravitating action of two given bodies varies inversely as the square of their distance from each other. How this medium can be regarded as a satisfactory cause of gravity I cannot imagine. In this hypothesis indeed there seem to be more places at which to stop and ask "How?" than in the common one. It places between the two bodies a chain of an infinite number of links, and at each link one might ask, How? and each question would, in each case, be as difficult to answer as that asked by Dr. Faraday. But it is not my place, nor that of any other inquirer, to ask how any phenomenon can be, or how any fact can exist, but merely whether it is, or is not. "What are the facts?" not "How can they be?" is the proper question to ask, and probably the only one we shall ever get answered. It is well, perhaps, to form reasonable expectations of the unknown, in order that our researches may be directed towards probable success; but it is at best a waste of energy to push our inquiries after the unknowable. The effort to answer such questions as the above seems to me like listening for that which is not audible; like straining the eyes to see that which is not visible. If I am assured of the fact that gravity varies inversely as the square of the distance, I am satisfied, and shall not vex myself by inquiring how it can be so, though I should be glad to learn of any new discovery of related facts.

I think, indeed, that Professor Faraday is looking for a law which known facts do not indicate, and which therefore he is not likely to find; the only general law of conservation which ascertained facts appear to follow is an extension of that principle of mechanics which requires equality of action and reaction, and which Newton made his third law of motion. This law, made general, requires that every change wrought upon one material body shall be compensated by an equal and opposite change in the same or in another material body. This idea of general permanence seems to me all that is suggested or proved by the scientific facts with which Faraday is so conversant, and which he seems to have somewhat misinterpreted. This is the only law of conservation to which the operations of heat, light, electricity, magnetism, chemical composition, and gravitation seem to be subject. In electricity the disturbance of the electric condition of one body is always accompanied by an equal and opposite disturbance of the electric state of another body. When two bodies of different temperatures are placed in communication, the mutual action which heats the one cools the other; and these reciprocal effects are not only opposite but equal; and so with magnetism. In the same magnet this law of the equality of action and reaction is fulfilled; its two poles exhibit equal and opposite disturbances. But this law of conservation does not demand that the total amount of separated positive electricity should remain unalterable, but only that it should be equal to the negative. It does not require the total quantity of south polar magnetism should be constant, but only that it should equal the north polar. Again, in the phenomena with which the science of mechanics has to do, the law of conservation, as I have stated it, does not demand that the physical force (in the mathematical sense) in the universe should remain constant, but that the force which generates a momentum in one direction should always generate an equal momentum in the opposite direction. The change in a body's condition of rest or motion is properly regarded as varying in the compound ratio of its mass and the change in its velocity. The idea thus compounded of the ideas of the mass and velocity is called the momentum of the body; and it is the sum total of the momenta of the bodies which is conserved and remains constant. This law a mathematician might express by an equation; denoting the masses of the various bodies in existence by M_1, M_2, M_3, &c., and their respective velocities in any direction whatever, by V_1, V_2, V_3, &c., he might say that the aggregate $M_1 V_1 + M_2 V_2 + M_3 V_3 + \&c. =$ a constant quantity, or $\Sigma M V = C$, making Σ the sign of summation. If any force interfere to alter the velocity V_1, it must not produce this effect alone; it must also work such an effect upon one or more of the other velocities above given as to keep the sum of the whole unchanged. If I may be allowed to denote the sum total of the masses in existence by M_s, and the velocity of their centre of gravity by V_s, then

$$\Sigma M V = M_s V_s .$$

It does not seem very likely that the centre of gravity of the universe has a constant motion. It will not, therefore, be unreasonable to suppose $V_s = 0$, and hence

$$\Sigma M V = 0.$$

This law we may regard as demonstrated. There may certainly be in existence a law in consonance with Faraday's views, but I think it well to wait its discovery and proof before we recognize it as a law of nature. Such, at least, is the insignificant intention of, Sir, yours, &c.

A Mechanic.

SUBSTITUTE FOR LIGHTHOUSES.

To the Editor of the Mechanics' Magazine.

Sir,—I beg to explain to you a suggestion that has occurred to me for a lighthouse, or rather to supersede one, and which I consider would be cheaper and more efficient than the present plan; this suggestion being to employ a small balloon, with a light to it, and a long string attaching this balloon to a fixed barge; the great length of the string, of course, giving a much greater extension of light than a lighthouse can do, and being of very trifling expense. I am, Sir, yours, &c.,

Lewis Gompertz.

Oval, Kennington, April 6, 1857.

INDIA-RUBBER AND ITS ADULTERATIONS:

IN CONNECTION WITH THE MANUFACTURE OF INVALID WATER MATTRESSES AND CUSHIONS.

To the Editor of the Mechanics' Magazine.

Sir,—There is no necessity for the monstrous charges at present made for these goods, and therefore I desire to open the subject in your fearless Journal. The amount of adulteration necessary to bring up the desired colour, is from 5 to 10 per cent. of the pigment termed *oxide of zinc;* but the formula used, for the manufacture of the water or air mattresses and cushions referred to in the heading, contains about 35 per cent. of this cheap substitute for India-rubber. In writing thereon I take leave to state at the outset, that, like the

"air," or Mackintosh cushions or pillows, we have known for so many years, they can be had of any size or shape, and differ from them in being of pure caoutchouc, or elastic gum (*minus the adulteration*), instead of only a *thin coating* of pure gum, upon a cloth or non-elastic foundation. Hence their increased value to medical men in preventing bed sores, &c.

May I be allowed to say, Sir, that in my judgment, what is understood in these days by the word "humbug," has gained such ascendancy over common sense, that honourable people, who disdain to practise it, are so out-distanced by the many who do, that they lose thereby several of the chances of trade. This "popular pet humbug" is, therefore, largely dealt in by puffing advertisers (even in these articles), who perpetually issue illustrated catalogues, &c., (under the words "patent," where none exists, "Improved Hydrostatic Water Mattresses, "Inventor," and "Sole manufacturer," and a host of other fanciful and attractive names,) through our Post-office, to the whole medical profession in the United Kingdom, as well as to the staff of medical men connected with all the hospitals, Poor Law Union Infirmaries, East India, and other companies, &c., and these mattresses are now in use at most of such establishments; and if the retail prices were not highly (as I consider) extortionate, and altogether beyond all reasonable limit, I would not throw the "sunshine" upon this valuable medical appliance. It just strikes my memory that there is a quiet notification in the interior of the envelopes enclosing these circulars, that a discount of 12½ per cent. is allowed to "the profession" (but which some refuse). I may as well add, that these dealers of course have no exclusive right to the above names, as they would lead the public to infer; the manufacture being as free as the air we breathe; and of "hydrostatics" they understand about as much as they do about general "chemistry," and I am quite sure, that of the latter exquisite science they know only just as much as the letterer can actually embody and make inherent in the words he may be instructed to paint on the door posts or facia outside.

It is a melancholy truth, Sir, that this lettering is now accepted as proof that the "professor inside," is, in fact, a "practical" or "operative chemist," though he may live and keep shop at the West end of our metropolis, and exhibit a framed notification, that he is a "Member of the Pharmaceutical Society of Great Britain," but without examination. It is incredible, moreover, how these people, by their presumption, even seem to deceive medical practitioners, judging from the numerous "good names" they append to some of their most valueless compounds of exhausted roots. In many cases beyond the capacity of informing an inquirer why, in "camphorated spirit" the addition of "water" precipitates free camphor (to use a figure), they know no more of chemistry than the writer's "foot;" and yet if one had not daily experience and proof that true science is modest and retiring, one would be liable to put these "professors" down as real living "Faradays" "Herapaths" "Redwoods" and other equally illustrious chemists, instead of quacks. Excuse my digression, but these characters who disgrace an intellectual science, will cross one's mind in writing.

Returning to the water mattresses, I will show in figures the manufacturer's price in 1850, and the manufacturer's charge in May, 1856 (and it must be less at this moment), and the uniform retail price, and to this latter I invite the especial attention of your readers, and ask them carefully to note the retailer's profit on each, and decide the advantage to be derived from purchasing of the manufacturer. I have no personal interest in any of them. I will show also the usual sizes, and their weight, as they are all sold by the manufacturers on this basis. I trust this may stir up increased demand for so useful and necessary an article for the alleviation of human suffering, the use of which the immense retail profits have hitherto prohibited among the middle and humbler classes.

The formula for water mattresses and cushions (India-rubber) is:

	s.	d.
1 lb. Para gum (in sheet) . . (present cost, 1s. 7d. per lb.)	2	0
6 ozs. oxide zinc	0	1½
1 oz. pure sulphur (common equally good)	0	0½
Mill costs	0	3
	2	5

or 1s. 7d. per lb.

	s.	d.
Say, of the above compound, 1 lb.	1	7
Making waste	0	3
Grinding, running, cleaning, and vulcanizing	0	6
Add 33⅓ mill profit, or	0	10

or 3s. 2d. per lb.

This is the price per pound the weight should be estimated at.

It will be perceived that the manufacturing costs are 9d. per lb., and though very properly fully charged, it brings the goods we are discussing fairly up to the scale, and purchasers can estimate the retailer's profit, by any excess in charge, which the scale of charges now subjoined will illustrate.

The sizes of mattresses and cushions kept in stock (India-rubber) are:

Size in inches.		Manufacturing charges, 1852.		Manufacturing charges, 1856.	Retail Price. £	s.	d.	Weight.	Retail Price.
8×14	without cells.	each 6/	7½ per cent. discount.	3/4 per lb. or each 4/	each 0	17	6	about 1lb.	each 13/6
10×16		„ 8/		„ „ 5/	„ 1	5	0		„ 20/
15×20		„ 15/		„ „ 8/4	„ 1	15	0	2¼	„ 26/8
17×20		„ 17/6		„ „ 9/2	„ 2	0	0	2¾	„ 30/10
17×22		„ 18/9		„ „ 10/0	„ 2	5	0	3	„ 35/
20×23		„ 22/6		„ „ 13/4	„ 3	5	0	4	„ 41/8
27×30	with cells.	„ 42/6		„ „ 30/	„ 5	5	0	9	„ 75/
30×40		„ 63/		„ „ 36/8	„ 6	16	6	11	„ 99/10
33×72		„ 89/4		„ „ 57/8	„ 9	9	0	17	„ 131/4
36×72		.. ..		„ „ 63/4	„ 10	10	0	19	„ 146/8
42×72		other sizes in		like proportion.	„ 12	0	0	other sizes	and others in
48×72		.. ..		.. ..	„ 13	10	0	in same ra.	similar proportion.
Crescents	about 18×18	each 9/2		3/4 per lb. or each 9/2	„ 2	0	0	2¾	each 30/10
Circulars		„ 8/4		„ „ 8/4	„ 1	15	0	2¼	„ 26/8

Should so serviceable an article be thus clogged and fettered by such immoderate charges by the retail shopkeeper? Probably your subscribers may say, But the consumption is so trifling! In reply thereto, I may remark, that one retail dealer in London in the year 1855, paid one manufacturer in net cash close upon 1,700*l.*, and I have reason to know that that amount is about or within the average sales of this dealer. Reckon his profit on this one account, and then know to a certainty whether it be trivial or not.

The history of the introduction of these goods is simply this; they were first made by Mackintosh and Co., and afterwards by Mr. J. Lyne Hancock, from really pure caoutchouc, but being in consequence black, the colour proved adverse to their sale. A few were then introduced by Burke and Co., of a pale red, arising (as I understand) from the sulphuret of antimony in connection with India-rubber; and these also were objectionable for medical use; and last of all, the successful operator appeared in the person of Mr. Stephen Moulton, whose address is given in my paper in your Magazine of December 6 (and formerly, as I believe, associated with that scientific gentleman in all that relates to "caoutchouc," Mr. Charles Goodyear). He introduced them of a pale straw colour from the use of just the necessary proportion of the pigment (oxide of zinc); and since then, 1849 or earlier, they have continued the favourite colour, varying a little according to any excess of cheap adulterating metal, of which the formula I have given must have the doubtful credit of ranking as one.

It may probably be a guide to some of your readers if I state, that the best size for a pillow is 17×22, and that the celled mattresses 27×30 and 30×40, are found most useful, and of adequate length to support the trunk of invalids, and admit the other portion of the body to rest upon the usual feather bed, and thus steady a weak patient; whereas, a full length mattress of this elastic gum (33×72) is beyond the safe control of such invalids, arising from the trunk of the body, being heaviest, displacing so much of the water and air as to raise the lower part above the level of the trunk, by which the patient is rendered exceedingly uncomfortable, saying nothing of the risk of being thrown from the bedstead on to the ground.

The retailer for obvious reasons recommends the larger mattresses, and which are not returnable, even if the patient dies before they reach him.

In close alliance with these goods, there is another surgical appliance made from pure caoutchouc in connection with silk or cotton webbing and is usually sold in an unvulcanized state; hence I refer to it in this paper. The articles manufactured therefrom are termed "Spiral Supporters," and if I am rightly instructed, were introduced and illustrated, by an ingenious Frenchman in Davies-street, Oxford-street, and impudently copied and illustrated in another man's catalogue, from fac-similes, obtained surreptitiously, which, as you may imagine, on discovery, excited the wrath of our warm ally; but he had no remedy in law, and the copyist's conscience did not, as I ever heard, yield him any compensation in "equity."

I must defer my remarks and formulas for hospital sheeting and waterproof slips; in the meantime, I thank you for the space you permit for the diffusion of these exposures of this adulterating iniquity in your independent Journal.

I am, Sir, yours, &c.,

W. H. Herbert.

FIRE ENGINES.

To the Editor of the Mechanics' Magazine.

SIR,—I have been thinking that if our fire engines were supplied from the high pressure main, they might be worked with fewer men and be just as efficient. If instead of the water running to waste the suction pipe of the pump were screwed on to the stand pipe on the main, they would have all the pressure of the head of water, whatever it might be, according to locality, in some cases equal to fifty and seventy feet. By taking advantage of this pressure you will easily see that a great amount of manual labour in many cases would be spared, and lessen in some degree the heavy expense necessarily attendant upon all fires. Of course the present pumps would require alteration to accomplish this, but that would be a small expense compared with the amount of gaining that I believe would accrue. If this idea should meet your views, perhaps you will give it a place in your useful work; it may be the means of drawing the attention of those more interested to examine and see whether such a desirable object is worth bringing into practice.

I am, Sir, yours, &c.,

J. WALKER.

13, City-road, March 31, 1857.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

RHODES, J. *Improvements in machinery or apparatus for reducing turnips and other vegetable substances to a pulpous state.* Dated Aug. 2, 1856. (No. 1830.)

Two shafts carrying toothed rollers interlock with each other, and carry down from a hopper the turnips through guides to a cutter plate, on which are screwed plates or knives radiating from the centre, which operate as scrapers, and reduce the turnips to pulp. A shaft provided with knives may be mounted at the upper part of the hopper for slicing the turnips preparatory to their being fed down to the toothed rollers.

GREEN, T. *Improvements in mowing machinery.* Dated Aug. 2, 1856. (No. 1831.)

Two arms or brackets are fixed to the front of the machine, one to each side framing. At the front ends of these arms are formed sockets to receive upright rods which at their lower ends receive the end of a shaft capable of being adjusted to regulate the height of the cutters from the ground. On the shaft are two wheels or narrow rollers, capable of being set at any distance apart so that when mowing a verge they may come upon or on either side thereof. The gearing wheels by which the cutters are driven are placed *within* the framing of the machine.

CADIAT, N. *The application of centrifugal force for purifying liquids.* Dated Aug. 4, 1856. (No. 1834.)

This invention cannot be described without engravings.

LAUNAY, C. T., and J. CHOPIN. *Improvements in increasing the illuminating power of gas.* Dated Aug. 4, 1856. (No. 1835.)

Gas, after it issues from the meter, and prior to its reaching the burner, is forced through wicks, cottons, &c., moistened with an essential or volatile oil, or liquid hydrocarbon, or other carburetting liquid, by the ends thereof dipping into cups containing such liquid.

WALKER, G., and J. SCRIMGEOUR. *Improvements in spinning frames.* Dated Aug. 4, 1856. (No. 1836.)

Spinning frame beams are raised and lowered by means of brackets and slots with binding and setting screws; the angle of the beam is altered by screws, and the angle of the thread plates and brackets is regulated also by screws. The details require engravings to illustrate them.

DAFT, T. B. *Improvements in the manufacture of cast-iron pipes.* Dated Aug. 4, 1856. (No. 1837.)

This invention was described at page 156 of No. 1749.

WRIGHT, A. *Improvements in lighting mines and subterranean places with gas.* Dated Aug. 4, 1856. (No. 1838.)

Apparatus is so combined at the summit of a mine, that the gas produced in the ordinary manner may be forced into a gas receiver weighted to a higher degree than ordinarily, and by means of a governor be regulated to the degree of pressure required in the mine.

FIRTH, J., and J. CRABTREE. *Weaving Scotch, Kidderminster, and Dutch carpets, by means of a power loom.* Dated Aug. 4, 1856. (No. 1839.)

One, two, or three tiers of boxes are used at each end of the loom, or one or more barrels in which boxes are arranged for the shuttles at each end of the loom, in such a way as to bring into action the particular shuttle or colour required up to the number of thirty, each shuttle to run any number of picks that may be required to form the pattern. The boxes are operated by a beam fixed above or below the main or driving shaft of the loom, one end of the beam being attached to the boxes by an upright; the other end is brought into contact with a tappet or plate wheel by another upright rod, attached to an horizontal rod, at the end of which is a pulley to act upon the tappets or plate wheel.

WOOD, H. W. *Further improvements in*

the manufacture of fuel, and for a new mode of preserving coal and coke and other fuel. Dated Aug. 4, 1856. (No. 1840.)

This relates to a patent dated 7th Dec., 1850. The patentee proceeds as before, but when the coal or coke is made hot, as described, he takes care that it is also made perfectly dry. He has also discovered that coal or coke and other fuel may be preserved by being enclosed in a lump or block of either of the mixtures described in the specifications of the above patent, or by being coated with pitch, coal-tar, rosin, &c.

SISCO, A. D. *Improvements in railway brakes.* Dated Aug. 5, 1856. (No. 1844.)

This consists principally in the use of eccentrics attached to the framing of the carriage for working railway brakes.

DANDURAN, J. J. *An apparatus called the self-swimmer.* Dated Aug. 5, 1856. (No. 1846.)

This apparatus is elongated at its upper part, and enlarged as it extends over the breast, terminating at the loins as a truncated cone; it holds the body in an oblique position, and keeps the head of the swimmer out of the water. It is divided in several parts at will, and these parts are united by straps. It is composed of metal, or of India rubber, &c.

KEITH, J. *Improved machinery for making envelopes.* (A communication.) Dated Aug. 5, 1856. (No. 1848.)

This invention is described at page 343 of this Number.

NEWTON, A. V. *An improvement in primers for fire-arm cartridges.* (A communication.) Dated Aug. 5, 1856. (No. 1849.)

The fulminating powder of cartridges is placed against a steel or iron disc, and between the disc and a cork, the cork and powder being enclosed by a brass cap having an orifice on its face, so that a portion of the cork may be exposed to a pin which penetrates the cork, and ignites the powder by concussive force, the disc serving for the pin to strike against.

PFALTZ, A. *A new and useful mode or process for making soap from rosin.* Dated Aug. 5, 1856. (No. 1850.)

For producing from common rosin a solid soap suitable for scouring purposes, and as a substitute for ordinary soap, the patentee combines with the rosin soap one-fourth or one-third of its weight of tallow or other fat soaps.

EVANS, T., jun. *Improvements in harness.* Dated Aug. 6, 1856. (No. 1856.)

In order to make harness or parts of harness strong and light, wire rope, wire cord, or wire line, is used upon a core of hemp, India rubber, flax, or cocoa nut fibre. The wire rope is connected to the parts of the harness by certain metal loops.

HALL, W., E. WYLDE, and W. WAITE. *Improvements in steam engines.* Dated Aug. 6, 1856. (No. 1857.)

This invention was fully described and illustrated at page 289 of No. 1755.

GOLL, A. T. N. *An improved button.* Dated Aug. 7, 1856. (No. 1861.)

This button, which may be of bone, metal, stone or glass, has on its under side a straight stem. To this stem two metallic arms are adapted, one fixed, the other moveable. The fixed arm is soldered to the stem of the button, perpendicular to it, forming a hook with the stem. The moveable arm clasps the shank by a small spring nipper, which turns round the stem, and moves above the fixed arm, and opposite to it. To fix the button the arms are placed one under the other, and passed through a hole in the garment. The moveable arm is then turned half round, and the button is fixed.

KING, S. *Improvements in spirit lamps.* Dated Aug. 7, 1856. (No. 1863.)

1. The steadying pieces or fins usually soldered to the wind-guard are put upon the outer air tube of the burner. 2. A groove is formed on the inside of the curtain of the nozzle, thus preventing the spirit going to the burner. 3. A coating and lining of tin, iron, or steel is placed in the nozzle. 4. A cross piece or bridge is used for the support of the button holder. 5. The aperture in the air tube is of an elliptic or other than square form. 6. The wood used is riveted to prevent the flame from heating the spirit in the reservoir, &c.

DEFRIES, C. *Improvements in the roof lamps of railway carriages.* Dated Aug. 7, 1856. (No. 1864.)

1. The oil vessel is so placed that the oil will not become heated by the flame of the lamp. It is of an annular form, and surrounds the metallic body of the lamp. 2. Air is applied to the burner by a band of perforated metal let into the body of the lamp, immediately above the glass. 3. The glass is attached to the body of the lamp by a ring of metal, which embraces a flange on the glass, and screws on to the bottom of the body. 4. The reflector is so arranged that it can be taken out separately when it requires cleaning.

LEESE, J., jun. *Certain improvements in machinery used for printing calico and other fabrics.* Dated Aug. 8, 1856. (No. 1867.)

Scrapers (or doctors) are used for removing the extraneous colour deposited by the printing cylinders upon the bowl itself, or upon the blanket or covering of the bowl.

AUSTEN, T. *A machine for ascertaining the propelling force of gunpowder.* Dated Aug. 8, 1856. (No. 1869.)

This invention was described and illustrated at page 313 of our last number.

GORSE, W. *A new or improved door fastener.* (A communication.) Dated Aug. 8, 1856. (No. 1870.)

A plate of metal is inserted between the door-post and the edge of the door, and is secured to the post by the closing of the door. The plate carries at its projecting end a plate, arm, or bolt, which prevents the door from being opened.

NEWTON, W. E. *Improvements in machinery for composing and distributing types.* (A communication.) Dated Aug. 8, 1856. (No. 1871.)

In the composing machine the types are arranged on end with their faces uppermost in a case divided longitudinally into compartments, (open at the top and rear end), of which there is one for each letter. The types are pressed forward in the case by the quods, of which there is one for each division, and which are blocks of a width just to fill the compartments. The remainder of the invention cannot be described without engravings.

WEBSTER, W. *An improved valve cock.* (A communication.) Dated Aug. 9, 1856. (No. 1875.)

A screw thread is cut upon the lower end of the valve stem, and works through a fixed nut on the under side of the cock; or a hole with a screw thread formed in it is made inside the valve stem, in which works a screw spindle, in one piece with the fixed nut before referred to: the valve is opened or closed by turning the valve stem or spindle.

WHITTAKER, T. *Improvements in the mode or method of washing or cleansing woven fabrics.* Dated Aug. 9, 1856. (No. 1876.)

Claim.—The arrangement of apparatus by which one part of the material to be cleansed, crosses, and comes in contact with another part, thereby causing a constant rubbing of the surfaces of the material, similar to domestic washing.

DARLINGTON, J. *Improvements in superheating steam.* (A communication.) Dated Aug. 9, 1856. (No. 1878.)

This primarily consists of certain valves, by which the degree of heat acting upon the steam tubes in the heating chamber may be regulated, and by the opening of which, with other means, the action of the superheating apparatus may be suspended.

MARCH, C. *Improvements in propelling and working ships and vessels.* Dated Aug. 9, 1856. (No. 1880.)

This relates to propelling ships, hoisting sails, &c., by a horizontal wind wheel placed on the deck.

REID, A. L. *Improvements in producing ornamental figures or devices and textile fabrics or other surfaces.* Dated Aug. 9, 1856. (No. 1881.)

This consists in passing powdered colouring matter through a perforated pattern upon the surface to be ornamented. The powdered fabric passes over a steam chamber or heated roller for setting the powder.

OWEN, E. *Improvements in the manufacture of gas, and in the obtainment of products arising in such manufacture.* Dated Aug. 9, 1856. (No. 1882.)

This consists in the production of gas, and also of ammonia, tar, and charcoal from waste hops, by means of ordinary gas-making apparatus suitably modified.

ANDERSON, G. *Improvements in the construction of taps or valves for regulating the passage of gas.* Dated Aug. 9, 1856. (No. 1883.)

This refers to a tap or valve which, in the seat, and in the motion of the plug or diaphragm, is somewhat similar to a four-way tap, that is, it is internally of a cylindrical or conical figure, and has four or more openings, any adjoining two of which may be placed in communication, by a thin partition fitted to the seat, in the manner of the plug of such taps, and which, on being turned, alters the passage of gas as required, or by modified arrangements.

FONTAINEMOREAU, P. A. L. DE. *A new electro-motive engine.* (A communication.) Dated Aug. 11, 1856. (No. 1884.)

This engine consists of a double series of concentric metallic rings forming armatures, in combination with two compound electro magnets.

CARTLAND, J. *A new or improved door spring.* Dated Aug. 11, 1856. (No. 1885.)

A helical or coiled spring of metal is so acted upon that it shall be coiled or uncoiled on the opening of the door. The spring has a winding action, instead of a lengthening or shortening action, as is usual with helical door springs.

BROOMAN, R. A. *An improved fermenting agent.* (A communication.) Dated Aug. 11, 1856. (No. 1887.)

The inventor takes bran or wheat, places it in a room at 85° Fahr., mixes it to a thick paste with water at 85° or 90°, and covers the vessel close. After twenty-four hours, the bran is converted into yeast.

MAILLARD, N. D. *An improved mechanical and magnetic compass.* Dated Aug. 12, 1856. (No. 1888.)

A second or supplementary needle is mounted upon a vertical shaft immediately above, and so as to work parallel with an ordinary magnetic compass needle, and the supplementary needle is made, by cogwheels or otherwise, to work a pointer on a vertical dial.

FIRTH, E. *Improvements in finishing mohair cloth.* Dated Aug. 12, 1856. (No. 1890.)

This relates to a method of producing upon ordinary mohair cloths effects to resemble bear, deer, hare, seal, or other skins or furs.

LESSER, D. *Certain improvements in machinery or apparatus for making "lozenges" or other similar articles.* Dated Aug. 13, 1856. (No. 1894.)

An upper and lower set of rollers compress the lozenge paste to a proper thickness for the die, and a box or sieve scatters finely-powdered sugar upon the upper surface of the sheet of paste as it goes through the rollers. That the under surface may also be powdered, the lower rollers revolve in boxes of pulverised sugar. When the paste has been thinned down, it is propelled over a bed containing dies; punches now descend, cut out the lozenge, and press it into the lower die, impressing a design upon both surfaces of the lozenge. These punches then rise from the dies, leaving the lozenge in them; the bed then moves, and plungers force out the lozenges on to a traversing cloth for drying.

KAY, R. D. *Improvements in machinery or apparatus for washing, scouring, cleaning, preparing, dyeing, or finishing woven fabrics, yarns, or threads.* (A communication.) Dated Aug. 13, 1856. (No. 1895.)

This consists—1. Of a combination of three well-known systems extensively used separately—"clapping or beating," "methodical washing," and "accumulation or advance." 2. In machinery for washing, scouring, preparing, or dyeing yarns or threads, which cannot be fully described without engravings.

CHURCH, W., and H. W. HAMLYN. *An improved method or improved methods of constructing or building hay and other ricks.* Dated Aug. 13, 1856. (No. 1896.)

The patentees construct a series of horizontal flues or shafts on the foundation on which the rick is to be built. These converge to the centre, and terminate in a vertical flue or shaft. About this system of shafts which provide ventilation, they build the rick.

CLARA, J. B. *Certain improvements in producing and employing steam and the gaseous products of combustion for obtaining motive power.* Dated Aug. 13, 1856. (No. 1897.)

These relate—1. To boilers for low pressure condensing engines, in which the furnace is smokeless. 2. To arrangements for economising the heat of the furnace, thereby obtaining a more rapid generation of steam, and preventing priming. 3. To the employment of soft water for feeding the boiler, and in means for condensing the steam, and re-employing it, whereby incrustation is prevented. 4. To a mode of superheating the steam. 5. To a method of uniting and protecting the joints of the boiler and fire-box.

HALLEN, E., and W. H. KINGSTON. *Improved means for making signals on railways.* Dated Aug. 14, 1856. (No. 1899.)

Levers, switches, &c., are to be acted on by the wheels of the engine, or by some part of the engine or carriage when the train is approaching a station or terminus, &c., and cause the "danger" signal to be made.

PRIEST, A., and W. WOOLNOUGH. *Improvements in horse hoes.* Dated Aug. 14, 1856. (No. 1900.)

A description of this invention forms the first article of this number.

KNOWLES, J., and W. CLARKE. *Certain improvements in looms for weaving.* Dated Aug. 14, 1856. (No. 1901.)

This applies to power looms in which two or more shuttles are employed interchangeably, and consists—1. In mounting the moveable shuttle boxes in the form of a cylindrical segment, parallel to the axis of the cylinder, and partially rotating upon such axis for the purpose of bringing the boxes in due succession into their working positions. 2. In certain self-acting mechanism for governing the position of the moveable boxes, so as to change the shuttles in a determinate order, and at prescribed intervals.

BILBE, J. *Improvements in the construction of ships and other vessels.* Dated Aug. 14, 1856. (No. 1902.)

This applies to frame timbers and beams for ships. The patentee bends two angle irons to the proper mould, and places them at a suitable distance apart, having their edges towards each other. Into the space between he bends wood so as to bear against the curved backs, thus forming a compound timber or beam. Holes are provided to permit the passage of bolts for the planking.

MORGAN, W. *Improvements in the manufacture of guns and mortars.* Dated Aug. 14, 1856. (No. 1903.)

Separate parts are forged into rings, and their ends are turned into male and female V's made accurately to fit each other to gauge. The hollow cylinders thus fit into each other and are placed and held together, and the parts to be joined are raised to a welding heat, and perfect union of the metal contact surfaces is assured by means of great pressure in the direction of the axis of the cylinder.

GODEFROY, P. A. *An improved treatment of the matrix of rock quartz, and all like substances, for the extraction of auriferous, argentiferous, and other metals contained therein.* Dated Aug. 14, 1856. (No. 1905.)

The patentee divests the pyrites (or mundic) of all silicious and aluminous matter, by grinding it to the fineness of wheaten flour, and then thoroughly washing it. It is then mixed in a tub with hydrate of lime, and then steamed in a digester to clear it of sulphur. It is next cooled down, the liquid is run off, and the residuum well washed. The separation of the metals may then proceed as usual.

SMITH, J. B. *Certain improvements in machinery for preparing, spinning, and twisting cotton and other fibrous substances.* Dated Aug. 15, 1856. (No. 1907.)

This consists—1. In admitting air near the axis of the beater of blowers, scutchers, &c., to assist in cleaning the cotton more effectually from impurities. 2. In the application of two wharves to each spindle of machines used in spinning and twisting, for economising space, and for obtaining uniform velocity in the spindles. 3. In the application of a rail or stay near the footsteps of spindles used in throstles, &c., to impart steadiness to the spindles, and prevent the wearing of the footsteps. 4. In the application of a tightening pulley to the driving strap of throstles, &c., for increasing the hold thereof on the pulley to be driven. 5. In making recesses at the summit of the spindles of mules, &c., for retaining the yarn in a line with the axis of the spindle during the twisting operation, thereby lessening the vibration of the yarn. 6. In a mode of constructing the back bars of top rollers.

HURRY, H. C. *Improvements in railway crossings.* Dated Aug. 15, 1856. (No. 1908.)

This invention was described at page 218, of No. 1752.

TRANTER, W. *Improvements in fire-arms.* Dated Aug. 16, 1856. (No. 1913.)

This consists in applying to revolving fire-arms several kinds of single action, double action, and treble action locks; also a method of arranging such locks in the fire-arm, by turning out the cavity in the body or frame for the works by means of a lathe; also, several combinations of mechanism for forcing the bullets into the chambers of revolving fire-arms.

HARGREAVES, W. *Improvements in Colliers' combing machine, in combing wool, hair, cotton, silk, flax, and other fibrous substances.* Dated Aug. 16, 1856. (No. 1914.)

The specification of this patent is very carelessly and unintelligibly drawn.

CHALMERS, D. *Improvements in looms for weaving.* Dated Aug. 16, 1856. (No. 1916.)

This relates—1. To modes of giving oscillating movements to a series of shuttle boxes, instead of vertical or rotary motion. 2. To a combined "setting off" and "taking up motion." 3. To an improved fly reed. 4. To an improved temple, which consists of a bar of metal having from the middle a semi-turn or twist from end to end. 5. To various improved arrangements connected with the wire loom.

BROWN, J. W. D., and G. G. *Improvements in signal lanterns.* Dated Aug. 16, 1856. (No. 1917.)

This consists in combining the lenses together at their edges by grinding and fitting them accurately, thus avoiding the use of any upright framing between them.

LILLEY, S. *Improvements in the manufacture of ships' iron work, a part of which improvements is applicable to the manufacture of other articles in iron.* Dated Aug. 16, 1856. (No. 1919.)

This consists in the manufacture of slides, blocks, and other castings for ships by the use of chilled moulds, that is, metal moulds, in place of the ordinary sand moulds. It is also applicable to the casting of door knockers, cannons, pulleys, fenders, &c., &c.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

EVANS, J. *A progressive lever, by which is obtained an increase of power over the amount of power applied.* Dated July 31, 1856. No. (1808.)

This consists of a frame and certain rods, levers, cranks, axles, winches, and counterpoises. The arrangement cannot be described without engravings.

PATON, W. *Improvements in railway wheels.* Dated Aug. 1, 1856. (No. 1817.)

This relates to railway wheels composed of metal and wood combined. In one modification, the nave and spokes are of wrought iron forged in one piece. The arms are flat, and the rim portions for receiving the tire are formed with deep external flanges on one side, forming with the circumferential rim portions a recess for a wooden rim or felloe portion which encircles the spokes. This felloe is retained in position by transverse bolts. The wood being put on in pieces is clamped and bound up by an iron hoop shrunk on outside the wood. The actual tire is formed with a short edge flange on its inner plain edge, and is put on over the binding hoop, completing the wheel.

HARRIS, J. *An apparatus for collecting and condensing smoke and gases generated in furnaces.* Dated Aug. 4, 1856. (No. 1832.)

An iron fan is constructed to revolve in a chamber, having a communication by means of a pipe with the furnace or flues. Another pipe from the chamber passes into

a receiver containing water. The smoke and gases are collected from the flues by the fan, and forced into the receiver; the deposit, being principally carbon, is afterwards separated from the water and re-used as fuel.

GOTTGETREU, C. G. *Lithographic printing in oil and varnish colours and metal, on glass, wood, papier mâché, marble, metal, porcelain, or any other material that offers a suitable surface.* Dated Aug. 4, 1856. (No. 1833.)

The inventor prints colours and metals (as bronze, silver, or gold,) successively on paper which has undergone a preparation with various gums invented by him for this purpose. After being printed the paper is fixed by rubbing to the glass, &c., and the paper is removed by being pulled off in a damp state.

BOWEN, J. B. *Improvements in the manufacture of gloves.* Dated Aug. 5, 1856. (No. 1841.)

In gloves for driving, riding, &c., wherein the fore finger and parts of the second and third fingers and thumb are protected by leather or skin, side pieces and gussets are dispensed with, by a peculiar method of cutting.

VASSEROT, C. F. *Improvements in machinery for cutting nuts, screws, and pieces of polygonal shape.* (A communication.) Dated Aug. 5, 1856. (No. 1842.)

This consists in cutting all the sides of several nuts, &c., at the same time; also in tapping the nuts and cutting the screws on bolts or pins in the same machine. The frame of the machine carries a plate which has on its surface six small spindles (for a hexagonal nut or piece) on which are fixed tools, which in their rotation take away the parts presented to them.

MARPLES, T. *Improvements in corn-mills.* Dated Aug. 5, 1856. (No. 1843.)

This invention, which is applicable to mills for grinding grain, drugs, chemicals, &c., cannot be described without engravings.

SMITH, A. and W. *Improvements in ruling or delineating ornamental figures.* Dated Aug. 5, 1856. (No. 1845.)

Instead of the ruling pens employed in the machinery patented by W. Smith, 14th Nov. 1853, small wheels or rollers are used in carrying out the present invention.

BLOMELEY, E. *Improvements in the manufacture of fabrics applicable to various purposes, for which air-proof and water-proof fabrics are usually employed.* Dated Aug. 4, 1856. (No. 1847.)

Pulp cloth, or paper cloth, or paper mounted on cloth, is subjected to the action of oil or other suitable preparation, and imbibes and becomes saturated with it.

MONNIER, J. A. *Improvements in transmitting motive power.* Dated Aug. 5, 1856. (No. 1851.)

For transmitting power from one rotating shaft to another, a water wheel is fixed on a driving shaft, which has three pulleys fitted to it, so that they are alternately driven in the direction of the driving shaft during a third of a revolution, and then allowed to run back. The releasing of the pulleys is effected by spring cotters, cams, and levers. The levers are furnished with palls which alternately take into ratchet wheels keyed on the shaft to which the power is to be transmitted.

MITCHELL, A. *Improvements in apparatus for exhibiting and distributing advertisements, and for like purposes.* Dated Aug. 6, 1856. (No. 1852.)

The improved apparatus consists of a box or case so fitted that cards, &c., (intended for distribution) may be withdrawn, one at a time, by means of a handle and a slide. On the front of the box, placards, &c., may be displayed.

PALMER, G. H. *Improvements in furnaces for generating heat.* Dated Aug. 6, 1856. (No. 1853.)

The parts of a furnace are so arranged that the fuel may be subjected to a double decomposition, first undergoing the process of carbonization, and afterwards undergoing in a separate chamber further combustion exclusively for the generation of carbonic oxide, the union of which with the products of the green coal, and with atmospheric air, produces a volume of intensely heated gases.

WATT, W. *Improvements in treating or preparing Indian corn and other grain for fermentation and distillation.* Dated Aug. 6, 1856. (No. 1855.)

The inventor steeps Indian corn in water at about 60° to 100° Fahr. for softening it. He then conducts the malting process in a moist atmosphere at about 60° to 100° Fahr. He also steeps the corn in the water in which corn has been previously steeped for a longer period, to enable him, without malting, so to decompose the matter that the starch can be easily brought to a fine state of division by grinding with water.

BRABY, J. *Improvements in sawing machinery.* Dated Aug. 6, 1856. (No. 1858.)

This relates to the saw bench of sawing machinery, in which an endless belt of steel with a serrated edge is employed as the saw. The bench is furnished with an adjustable centre block which, being mounted in a slot or groove, may be moved to and fro, and has an arm for holding the block of timber, which may then be cut into segments of circles of any given radius within the capacity of the holding arm.

Another improvement consists of a fence, which is moved forward by a parallel motion. Another consists in contrivances for steadying and grinding the endless saw, and compensating for stretching.

Farrar, J., and H. Spencer. *Improvements in apparatus for regulating the pressure and flow of gaseous fluids.* Dated Aug. 6, 1856. (No. 1859.)

To the inlet or outlet pipe or other chamber is adapted a valve formed with a cylindrical dish or tube, having conical or V-shaped openings at its lower edge or end, which dips into mercury in a cistern formed around the end of the pipe or chamber. 2. An adjustable stop piece or part is applied to the pipes or other chambers, which, when set, will regulate the extent of opening of the cocks or taps.

Weber, L. *A combination applicable to keys of door-locks to prevent their being opened by pliers or other instruments from the outside.* Dated Aug. 7, 1856. (No. 1860.)

This cannot be described without engravings.

Green, W. *Improvements in the manufacture or production of fabrics and surfaces, in imitation of, and as substitutes for, leather for bookbinding and other uses, and in machinery or apparatus for effecting the same.* Dated Aug. 7, 1856. (No. 1862.)

The patentee procures a *fac simile* in reverse of a piece of hard grained morocco or other leather upon a cylinder (by the electrotype process or other means). This roller is worked in an ordinary embossing machine, and produces upon continuous lengths of fabrics, imitations of morocco, &c. The fabrics are previously coated.

Wright, C. *Improvements in the preparation of lubricating materials.* Dated Aug. 7, 1856. (No. 1865.)

Soft soap, soda ash, tallow, palm oil, and water, are heated and thoroughly mixed together.

Davenport, R. *Certain improvements in kilns for burning pottery, earthenware, china, porcelain, and similar substances to enable them to consume their own smoke.* Dated Aug. 8, 1856. (No. 1866.)

The smoke is passed with atmospheric air through a fire perfectly distinct from, but connected by flues with the fire by which such smoke is generated, and the flame from the first-named fire is conducted to the body of the kiln.

Stephens, J. *An improvement in pipes for smoking.* Dated Aug. 8, 1856. (No. 1872.)

The inventor describes a pipe which permits of fumes of tobacco being drawn up into the mouth through ice, and prevents the water into which the ice is converted from falling into the bowl.

Fehrman, D. *Improvements in lamps adapted for burning resin oil.* (A communication.) Dated Aug. 8, 1856. (No. 1873.)

This oil has hitherto deposited tar, &c., in the wick. To remove this deposit a tube is used, which surrounds the exterior tube of the burner, and projects above it. The tar descends between the two tubes, into the dripping cup. Other tubes, &c., are used.

Kopp, E. *Improvements in the manufacture of gas.* Dated Aug. 9, 1856. (No. 1877.)

By means of suitable mechanical arrangement, such, for instance, as an endless iron chain and a piston, fuel is continually introduced into the retorts, passes slowly through them, disengaging gas, and is converted into the coke, which is continually discharged.

Amyot, E. E. *Improvements in the preparation of pulp for paper, pasteboard, and other uses for which pulp is required.* Dated Aug. 9, 1856. (No. 1879.)

The inventor strips the bark from the log and cuts the wood into small pieces or shavings, in the direction of the grain, and places the pieces into a boiler containing water, to which protoxide of calcium is added, and boils the whole for three or four hours. He then submits it to trituration.

Symons, A., and E. Burgess. *Improvements in noctuarys or tell-tales for ascertaining the fidelity of watchmen and for other purposes, and in the application of electricity to such apparatus.* Dated Aug. 11, 1856. (No. 1886.)

Between two rollers a strip of paper is passed continuously, at a determined rate, and this paper is marked with hour marks, and marks for the quarters, &c. The paper passes over a flat surface perpendicular to which are placed pencils or markers. When it is the watchman's duty to indicate his presence, he depresses the pencil by suitable arrangements, sometimes by means of electricity, from a distant place.

Janet, A. R. *A certain apparatus for taking measure of coats.* Dated Aug. 12, 1856. (No. 1889.)

The object here is to give to the tailor the exact shape of a man. A few bands fastened together with a nut and screw of pressure form the whole apparatus, which cannot be described fully without engravings.

Downing, J. W. *Improvements in the manufacture of metallic and other wheels and pullies.* Dated Aug. 12, 1856. (No. 1891.)

The bushes or bosses of metallic wheels are cast in metal moulds the ends of the spokes being inserted in the moulds, so that the bushes are cast and the spokes fixed therein at one operation. On non-

metallic wheels an annular metal plate is placed on each side of the wheel, so as to come flush with the edge, and take part of the wear.

BROWN, W. H. *Improvements in steam hammers.* Dated Aug. 12, 1856. (No. 1892.)

This relates to a combination of the valves for steam hammers, whereby a quicker action than usual is obtained.

HARDAKER, J. *Improvements in machinery or apparatus for stopping railway trains, which are also applicable for alarm signals generally.* Dated Aug. 12, 1856. (No. 1893.)

It is proposed to fix at certain places on a line of railway an apparatus which will be acted upon by a passing train, which train will leave the apparatus in a position to act upon the next train, (if it be within a certain distance of the first) so as to turn off the steam, turn on the whistle, put on the breaks, and stop the train.

BROOMAN, R. A. *Improvements in the manufacture of artificial stone and building and paving materials.* (A communication.) Dated Aug. 14, 1856. (No. 1898.)

Artificial stone is manufactured by mixing lime, ashes or cinders, and a pulverised earthy oxide, or oxide derived from clay or natural stone, with water and sand. The oxide and ashes are first mixed up and saturated with water, and the sand then added. Asphaltic stone is manufactured by substituting an asphaltic oxide of the sand, and adding dried powdered peat, or other fuel. Fire-brick or refractory building material is manufactured by combining an earthy refractory oxide with sand. Mosaics and artificial marbles may be produced by combining two or more compositions manufactured as described, and employing pressure.

BANNEHR, J. *Improvements in the manufacture of name and sign plates, boards and slabs, door and house numbers, street names, tombstones and monumental slabs, and inscriptions, by substituting earthenware or porcelain, instead of the materials now in use for the above-named articles.* Dated Aug. 14, 1856. (No. 1904.)

This consists in forming the above articles of earthenware or porcelain, and then properly burning or firing them.

GODDARD, J., and G. HULME. *Improvements in carding engines for the more speedy and effectual doffing or stripping of the cotton, woollen, silk, or other fibrous substances therefrom.* Dated Aug. 14, 1856. (No. 1906.)

This consists in adapting to carding engines a doffer by means of which the inventor is enabled to adjust, by means of set screws or other convenient means, the comb of the doffer bar to the greatest nicety without touching the teeth of the cards.

JOWETT, H. A. *Improvements in rails and railway chairs, and in the construction of railways.* Dated Aug. 15, 1856. (No. 1909.)

This consists—1. In the construction of a tubular rail of four wearing surfaces. 2. In the employment of a plain wrought iron bracket or angle plate forged to the shape of the rail. 3. In cutting about a quarter of an inch into the sleeper the shape of the bearing surface of the rail, for giving the proper angle to the rail to suit the bevel of the wheels.

KIS-GERESD, C. S. S. DE. *Improvements in obtaining motive power.* Dated Aug. 15, 1856. (No. 1910.)

This consists of machinery by means of which, combined with the gravitating force of heavy fluids, motive power is to be obtained. It cannot be described without engravings.

PROVISIONAL PROTECTIONS.

Dated December 20, 1856.

3017. Edward Loos, of Leicester-square, civil engineer. Improvements in the manufacture of cement, mortar, concrete, and artificial stone.

Dated December 22, 1856.

3031. Thomas Roberts and John Dale, of Manchester, manufacturing chemists, and John Daniell Pritchard, of Warrington, chemist. Improvements in the manufacture of oxalate of soda, which improvements are also applicable to the manufacture of oxalic acid.

Dated February 27, 1857.

579. William Henry Thornthwaite, of Newgate-street, London. Certain improvements in barometers.

Dated March 4, 1857.

632. Thomas Brown, of Fenchurch-street, London. Improvements in capstans.

Dated March 19, 1857.

769. Joel Williams, of Mold, Flint, engineer. Improvements in cocks or taps.

771. Samuel Campbell, of Newington, Surrey, vegetable preserver. Improvements in preserving vegetable substances.

773. William Reid, of Shettleston, Lanark, N.B., colliery manager. Improvements in safety apparatus for guarding the mouths of pits, excavations, and other openings.

775. William Gwillim Merrett, of Leadenhall-street, surgeon. An improvement in coats and waistcoats.

Dated March 20, 1857.

777. Jean Ninck, of Brewer-street, Golden-square, dentist. Improvements in placing sets, or partial sets, of teeth, gums, and palates, on plates.

779. Henry Hall, of Spotland, Rochdale, cotton spinner and manufacturer. An addition to "throstles" for doffing the bobbins.

781. Charles Weiss, of Huddersfield, commission merchant, and Henry Lister, of the same place, manufacturer. Improvements in the means, machinery, or apparatus employed in the finishing of mohair and other textile fabrics.

783. John Parker, of East Markham, near Tuxford, Nottingham, agricultural mechanist. Improvements in apparatuses for separating corn and other grain and seeds from dust, chaff, and other matters.

785. John P. Jourda, of New York, U.S.A. Raising sunken vessels.

787. George William Sayer, of Cognac, France, merchant. Improved machinery for stopping or retarding railway carriages.

789. William Johnson, of Lincoln's-inn fields, civil engineer. Improvements in steam boilers and furnaces, and in apparatus connected therewith. A communication.

Dated March 21, 1857.

793. William Banks and John Banks, of Bolton, Lancaster, bleachers. Certain improvements in machinery or apparatus to be employed for washing, scouring, or bleaching cotton, linen, and other textile fabrics.

795. George Perrott, of Cork, Ireland, iron ounder and millwright. Improvements in horse gearing.

797. Richard Archibald Brooman, of 166, Fleet-street, London, E. C., patent agent. An improved method of driving the spindles of spinning frames. A communication.

799. James Edward Cole, of New York, U.S., ship master. Improvements in the rig and working the sails of square sail vessels.

801. Robert Mushet, of Coleford, Gloucester, metallurgist. Improvements in the manufacture of cast steel.

803. Frederick Shand Hemming, of Westminster, mining agent and engineer. Improvements in the mode of treating peat, mixed or not mixed with other vegetable or animal fibrous substances, and in the application of the same to various purposes.

805. Thomas Howard Head and Joseph Wright, of the Teesdale Iron Works, Stockton-on-Tees, engineers and ironfounders. Improvements in casting railway chairs, and in the manufacture of other castings.

807. Henry Dolby and Edwin Thomas Dolby, of Regent-street Quadrant. Improvements in machinery used when printing several colours in succession on the same surface.

Dated March 23, 1857.

809. William Heap, of Ashton-under-Lyne, Lancaster, machinist. Certain improvements in self-acting slide lathes.

811. John Sherar, of Aberdeen, N.B., ironmonger. Improvements in oil and spirit lamps, by the formation of burners obviating shadow.

843. William Mills, of Lower Craven-place, Kentish Town. Improvements in the action of upright pianofortes.

815. Thomas Mordell Smith, of Hammersmith, and Cornelius Burke, of Earl-street, Kensington. Improvements in the preparation of materials applicable to the manufacture of candles.

817. Frederick John Jones, of Aldermanbury, London, warehouseman. An improved buckle or fastening.

Dated March 24, 1857.

819. Robert Hanham Collyer, M.D., of Park-road, Regent's-park, London. Improved machine for cleaning and purifying wheat and other grain.

821. Jean Alexandre Zibelin, of Paris, gentleman. Improvements in the fabrication of artificial wines, brandy, and vinegar.

823. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improvements in carding engines. A communication.

825. Thomas Lawes, of Chancery-lane. An improved construction of agricultural implement to be used in tilling the land.

Dated March 25, 1857.

827. William Henry Collins, of Birmingham, factor. Improvements in attaching knobs to spindles.

829. John Mickle, of Newcastle-upon-Tyne. Improvements in machinery or apparatus for reaping and mowing.

831. John Hewett, of Sheffield, public accountant. Improvements in sewing machines. A communication.

833. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. An improved construction of water meter. A communication.

835. John Henderson, of Lasswade, Mid-Lothian, N.B., gentleman. Improvements in writing instruments.

837. William Somervail, of Dunlop, Ayr, N.B., wool spinner. Improvements in the treatment or preparation of fibrous materials for being spun.

839. Charles Cowper, of Southampton-buildings, Chancery-lane. Improvements in the manufacture of shot and shells for rifled ordnance. A communication from J. M. Sigourney, of Watertown, United States.

841. Joseph William Wilson, of Banbury, Oxford, engineer. Improvements in the cutting tools used for rounding, surfacing, or otherwise operating on wood.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

860. George Gilmour, of Massachusetts, United States. A new and useful contrivance or mechanism for shackling or attaching another anchor to the chain of an anchor to which a vessel may be riding, his said invention being termed by him a "second anchor shackle." Dated March 27, 1857.

883. Antoine Joseph Quinche, of Paris, mechanician. Improvements in apparatus for counting, registering, and indicating the distance travelled by vehicles. Dated March 31, 1857.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," April 7th,* 1857.)

2806. H. E. Palmer. Improvements in photographic apparatus.

2818. J. M. Saunders. Improvements in cooking ranges.

2828. J. G. Taylor. Improvements in pencil cases.

2843. F. Peabody. Improved apparatus for obtaining motive power by the action of the wind.

2849. J. Longbottom. Improvements in apparatus for drying, roasting, carbonizing, and calcining vegetable, mineral, and animal substances.

2855. J. Fowler, junior. An improvement in the manufacture of wire ropes.

2862. J. Mizen. Improvements in apparatus for making gas, partly applicable to culinary or other domestic purposes.

2870. J. Deeley. Improvements in furnaces for smelting and melting.

2871. J. K. Cheetham. Improvements in the application of photographic pictures to metal and other surfaces, and in rendering the same applicable as printing surfaces.

2915. T. Vicars, senior, T. Vicars, junior, T. Ashmore, and J. Smith. Improvements in the

manufacture of biscuits, lozenges, and other like articles of confectionary.

2968. G. Littlewood. Improvements in printing geometric patterns.

2993. G. M. P. Swift Viscount Carlingford. An aërial chariot, or apparatus for navigating the air.

3038. W. Spence. Improvements in the manufacture of felt. A communication.

3041. W. E. Newton. Certain improvements in meters for water and other liquids. A communication.

3049. A. Heather. Improvements in ferry boats.

118. W. E. Newton. An improvement in rollers employed for calendering, mangling, and other processes of analogous character. A communication.

215. J. Whines. Improvements in machines for dovetailing, grooving, slotting, and rabbeting.

402. R. D. Kay. An improved method of using or applying a certain colouring matter, either singly or in combination with other colouring matters, to woven or felted fabrics, yarns or threads, either in the white or dyed state. A communication.

440. J. Cruikshank. An improvement or improvements in rolling iron and steel wire.

537. R. A. Brooman. Improvements in underskirts or petticoats. A communication.

561. T. G. Shaw. An improved thrashing and winnowing machine, which he calls frail thrashing machine, for corn and other grain.

597. T. H. Jennens. A new or improved manufacture of rollers or cylinders for printing fabrics.

612. R. A. Brooman. A method of constructing and heating buildings and apparatus for the winding of the silk from the cocoon. A communication.

644. W. Holland. A new or improved manufacture of runner notches and top notches for umbrellas and parasols.

683. H. R. Smith. Certain improvements in manufacturing and purifying gas made from coal or other bituminous substances for illumination.

771. S. Campbell. Improvements in preserving vegetable substances.

773. W. Reid. Improvements in safety apparatus for guarding the mouths of pits, excavations, and other openings.

781. C. Weiss and H. Lister. Improvements in the means, machinery, or apparatus employed in the finishing of mohair and other textile fabrics.

797. R. A. Brooman. An improved method of driving the spindles of spinning frames. A communication.

799. J. E. Cole. Improvements in the rig and working the sails of square sail vessels.

833. A. V. Newton. An improved construction of water meter. A communication.

860. G. Gilmour. A new and useful contrivance or mechanism for shackling or attaching another anchor to the chain of an anchor to which a vessel may be riding, his said invention being termed by him a "second anchor shackle."

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

742. William Edward Newton.
743. Alfred Vincent Newton.
757. Thomas Scott.
758. James Forsyth.
762. William Gossage.
766. James Higgin.
771. Bernhard Samuelson.
781. William Edward Newton.
782. James Howden.
786. George Francis Wilson and James Monroe Whiting.
789. James Smith.
792. Joseph Nash.
796. Emile Dupont.
800. Julian Bernard.
801. James Worrall, jun.
802. John Henry Johnson.
818. John Henry Johnson.
827. John Platt.
868. Giuseppe Devincenzi.

LIST OF SEALED PATENTS.

Sealed March 31, 1857.

2526. Adolphe Ernest Ragon.
2579. John White.
2581. Ebenezer Erskine Scott.
2635. Jean Baptiste Edouard Victor Alaux.
2650. William Clark.
2799. John Musgrave, jun.
2831. Joseph Latimer Clark.
2893. William Hooper, Joseph Fry, and George Nasmyth.
3074. William Clark.
31. Alexander Angus Croll.

Sealed April 3, 1857.

2316. John Hall, jun.
2323. James Allen.
2340. Oglethorpe Wakelin Barratt.
2342. Smith Bottomley and James William Crossley.
2346. Joseph Bunnett.
2351. James Chiosso.
2357. Thomas Dugdale, jun.
2436. John Smith.
2445. Joseph George.
2464. Charles Briqueler, fils.
2492. John Walley.
2764. Samuel Russell.
64. Julius Goodman, Abraham Myers, and Louis Goodman.
71. Thomas Ball and John Wilkins.
114. Sir James Murray
148. Robert Reeves and John Reeves.
157. Edwin Clark.
159. Edwin Clark.
175. Henry Chamberlin, jun.
193. John Rubery.
194. Gustave Perez di Termini.
221. Henry Bessemer.
259. Henry Chamberlin, jun.
353. John Henry Johnson.
364. William Wilkens.

Sealed April 7, 1857.

2354. William Bradford.
2356. Daniel Foxwell.
2364. Thomas King.
2370. John Shaw and Edwin Shaw.
2372. James Saul Hendy.
2375. Christopher Richard Norris Palmer.
2379. John McInnes.
2392. George Elliot.
2394. William and Jacob Todd.

2398. John Roscow.
2432. George Morton.
2451. Sir Francis Charles Knowles.
2617. Richard Archibald Brooman.
2751. Richard Archibald Brooman.
3080. Thomas Wilks Lord.
232. Edward Highton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris. Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1758.] SATURDAY, APRIL 18, 1857. [Price 3d.

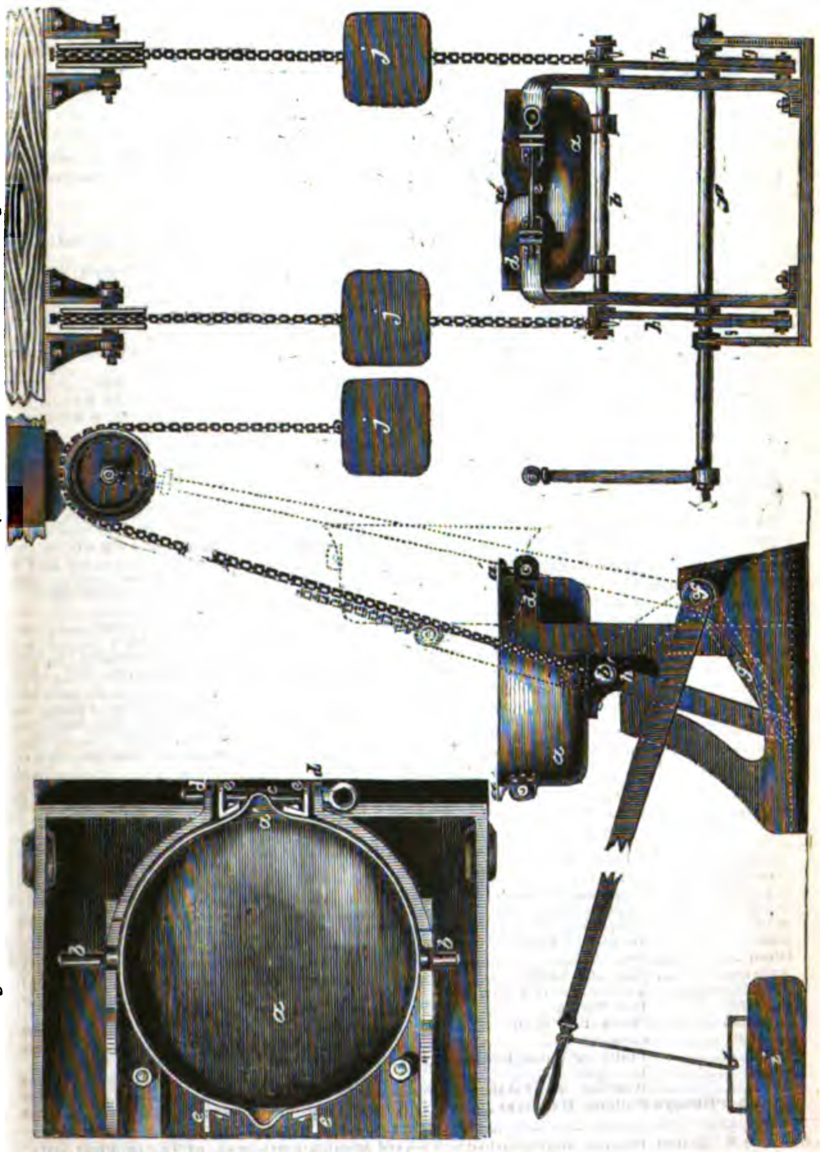
Edited by R. A. Brooman, 166, Fleet-street.

JOBSON'S PATENT APPARATUS FOR POURING METAL INTO MOULDS.

Fig. 3.

Fig. 1.

Fig. 2.



JOBSON'S PATENT APPARATUS FOR POURING METAL INTO MOULDS.

Mr. Robert Jobson, ironfounder, of Wordsley, Stafford, has contrived and patented the apparatus shown in the engravings on the preceding page, for pouring iron or other metal into moulds. Fig. 1 is a side elevation, fig. 2 a plan, and fig. 3 a front elevation thereof. *a* is the ladle or vessel into which the melted iron is received, and from which it is poured. This ladle is mounted on an axis, *b*, which is below it, and the ladle is capable of moving or being tilted on the front axis, *c*, which passes through the fixed frame, *d*, and through the lugs, *e e*, fixed near the lip or spout, *a'*, of the ladle, so that the front axis, *c*, is under the lip of the ladle; *f* is an axis on which are fixed two arms, *g g*, to which are attached two links or connecting rods, *h h*, the other ends of which are attached to the axis. On the ends of the axis, *f*, are fixed two lever handles, which, when the ladle is not to be tilted, are held down, as shown in fig. 1, by weights, *i*; but when it is desired to tilt the ladle, *a*, and to pour the melted metal from the spout or lip, the lever handles are released from the weights, and a workman or workmen cause the ladle to be tilted; the weight of the vessel and its charge is counterbalanced by the chains and weights, *j j*. When the ladles and their charges are not too heavy, only one lever handle need be used on the axis, *f*.

PROFESSOR FARADAY AND THE CONSERVATION OF FORCE.

Of none of her British sons may science be more justly proud than of Professor Faraday. Combining the most acute powers of research with the happiest and most brilliant mode of conveying to others the results of his researches, no adept in the arcana of science is more justly popular than he. Amongst the most delightful hours of our life we look back on those which we spent at his feet, drinking in from his almost-inspired lips the eloquent words by which he made his wonderful discoveries in electricity and magnetism, deep though they were, as plain as the noonday.

It is with no unfriendly feelings, then—quite the contrary—that we take up our pen to comment on his extraordinary lecture, which we have already inserted in our pages for the benefit of our readers.* It is because we honour and esteem Professor Faraday so highly, that we desire to see him withdraw from the course on which he has lately entered—a course which threatens to be injurious to the advancement of scientific truth in the popular world, and detrimental to his own high position amongst philosophers. We have had on a former occasion to lay before our readers what we conceived to be his unsound views on *lines of force* in electricity. Venturing now a step further, he has stood forward to arraign the received definitions and views of the scientific world with regard to force in general; and the fallacy of the remarks published by him with this view, it is our present duty, with unfeigned regret, and at the same time with undiminished admiration for the man, to expose.

Emerson, in his very remarkable, and in many respects truthful sketch of England, called "Traits of English Character," chants a funeral dirge over the supposed lifeless state of science in Great Britain, attributed by him to our slavish adherence to the method of induction, which, according to his views, fetters the wings of the intellect, and prevents its soaring aloft into those sublime regions in which the unfettered soul of German philosophy delights to revel. The *à priori* method will alone, in his judgment, again raise English philosophy from the dust and ashes in which she is represented as lying prostrate. He would hail the lecture of Professor Faraday on the Conservation of Force as a sign of a shaking among the dry bones—as an earnest of the restoration of science to a living form and vigorous existence, by a recurrence to the ancient *à priori* mode of inquiry.

But however captivating this course may be, we have yet to learn that any real advance of scientific knowledge has ever been attained by it. We have heard, indeed, how by the *subjective* principle the great truths of the Newtonian philosophy have been established by some of the apostles of the German school; but it has always unfortunately happened that the truths so established had already been satisfactorily based on the inductive principle. We do not deny that the attempt to connect together, in a kind of bird's-eye view, a group of philosophical facts which owe their existence in the domain of human knowledge to the painful toil of the observer, may be attended with most useful results. Nay, we will go further—we will allow that the habits of thought thus induced are amongst the most essential ingredients in the true philosophic mind, and will alone prevent the man of science from degenerating into the mere observer and collector of isolated facts, as Emerson says we all have done. We will allow that by this kind of reflection alone—by this generalizing upon *observed facts*, when pursued by a vigorous discerning mind, more

* See *Mechanics' Magazine*, Nos. 1755-6.

real knowledge and power—though not, perhaps, of a nature to be easily expressed in words, but manifesting itself in an enlarged grasp of the admitted truths of science, and in the clearness of the direction in which subsequent discoveries are sought—are acquired than by any other means; and thus the true philosopher day by day grows up to the perfect stature of a *man*. But he will not mistake his vocation. He will not start from *à priori* notions of what is true or what is false—possible or impossible. He will not seek in the depths of the human mind those types and ideas of physical truth which it is the care of the inductive philosopher to elicit from Nature herself. It was by no subjective process, by no searching for an ideal type of truth in his own mind, that Adams extorted from Nature the evidence of the existence of a new planet, and taught observers towards what regions of the heavens to direct their glasses to discover it. Let the *subjective* philosophy point to such triumphs, and we will bend the knee before her. Surely it is too much to call that philosophy lifeless—a mere heap of dry bones—which produces such results as this!

Nor can we congratulate the lovers of subjective science on the success which has attended so great a philosopher as Professor Faraday really is, when, abandoning the field of research in which he has been so pre-eminently successful, he ventures, *without the proper qualifications*, and trusting to the innate power of his own acute mind, into a domain of science which is confessed, by all who have laboured in it, to be among the most difficult and abstruse. In this lecture we probably possess the most successful effort that "one, who has little or no mathematical knowledge" could make towards "judging of the generality and force of a principle such as that which forms the subject of his remarks;" and we may hence estimate the value of his apology, "I do not perceive that a mathematical mind, simply as such, has any advantage *over an equally acute mind* not mathematical, in perceiving the nature and power of a natural principle of action." In this apology he seems to us boldly to adopt the principle of *subjective* philosophy of which Emerson is so enamoured, and we commend the fruits of this philosophy, as displayed in his case, to the serious and earnest reflection of the latter.

For the statement of Faraday's views on the imperfection of the received definition of gravitating force, we refer our readers to the lecture which we have published, and more especially to that part which appeared in No. 1755. By conservation of force he seems to understand that, viewing each particular force by itself, its "manifestation" must be "unchangeable," and its "nature inconvertible." Assuming then that the received idea of gravitating force is, "*that it is a simple attractive force exerted between any two or all the particles or masses of matter, at every sensible distance, but with a strength varying inversely as the square of the distance*," he asserts that this idea seems to "ignore entirely the principle of conservation of force:" and "by the terms of its definition, if taken in an absolute sense, '*varying* inversely as the square of the distance' to be in direct opposition to it." We may ask, who among philosophers has asserted conservation of force in this limited sense? On the contrary, it is a matter of fact, that by reason of the ellipticity of their orbits, the planets are constantly in the course of their revolutions round the sun, either approaching to or receding from that centre, and consequently the attractive force of gravitation upon them is either increasing or decreasing according to the law enunciated. *How* it should be brought to pass, that by so simple and small a change of condition as bringing two particles nearer to one another—for example, by diminishing the distance from 10 to 1—the force should be raised in the proportion of 100 to 1, is, and must probably remain a mystery. Until we know something more of the innermost conditions of matter, we must be content to acknowledge our ignorance. It is not denied that the "*law of gravitating action*," by which Dr. Faraday understands "the law by which the known effects of gravity are governed," is that of the inverse square of the distance; but "that the *totality* of a force can be employed according to that law," is questioned: and as a consequence of this objection, the received definition of gravitating force is stated to be either unphilosophical or incomplete. Farady seems to think that the objection which he raises is shared with him by the immortal Newton, when he says, "That gravity should be innate, internal, and essential to matter, so that one body may act upon another, at a distance through a *vacuum*, without the mediation of anything else, by and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man who has in philosophical matters a competent faculty of thinking can ever fall into it. Gravity must be caused by an agent, acting constantly according to certain laws; but whether this agent be material or immaterial, I have left to the consideration of my readers." With this sentence of Newton we cordially agree; but we do not find ourselves, on that account, any the nearer to agreement with Faraday.

That there is some broad principle of gravitating action underlying the statement of the law of the inverse square, seems to us to admit of no question; but that when this is discovered, it will necessitate an alteration of the received definition or law of gravity, we by no means admit. To Newton himself, who stated thus broadly his own belief in the existence of some further principle regarding the mode of action of gravity, we owe the very definition at which Professor Faraday cavils. Newton and he evidently look at this matter from different points of view. The speculations of the former, in the passage quoted, point only to the *medium* by which gravity may be supposed to act; the latter seeks a recognition of a presumed law of conservation of force which, as far as we know, never presented itself to the mind of the former, at least in the sense in which he understands it. Admit any law you please with regard to Nature's *modus operandi* in producing gravitating force; the definition of gravitating force, and all its multifarious consequences, ever will and must remain the same as they are now.

The learned professor, in his lecture, evidently confounds several things which, in mechanical philosophy, require to be kept separate and distinct. We cannot, it is true, conceive the *exercise* of force apart from *time;* and some most important practical results of force embrace the element of time; but it were unphilosophical and absurd, on that account, to introduce the notion of time into our definition of force itself. We cannot physically separate length, breadth, and depth; no line we can trace on paper, however fine, can possess one of those elements without the other two; but that we cannot succeed in representing length without breadth and depth also, is no reason why we should embrace these two dimensions in the definition of length. Besides, there are effects of forces with which the idea of time has no relation. When a body remains in a state of rest under the action of certain forces, this effect is evidently independent of time; and in forming an idea of equilibrium generally, time by no means enters as an element of our consideration. It is, then, apparent that a definition of force, which *necessarily* includes the idea of time, would be incorrect. The mechanical philosopher, ever since the days of Newton—who was the first to separate clearly between the idea of force and several more complex ideas in which force enters only as one element —has seen the necessity of carefully restricting the definition of force so as to be independent of all *duration* of time. In the same way *momentum* and *vis viva*, by which we understand the product of the quantity of matter and the velocity, in one case, and of the square of the velocity in the other, are ideas in themselves independent of time, although a *change* from one amount of momentum or *vis viva* to another necessarily implies a duration of time in which this change must be effected, however short in some cases that duration be. Probably no one but a mathematician, who has traced the several consequences of the action of forces in varying conditions, ever comprehended the importance of keeping these several ideas distinct, or ever formed a clear and definite idea of force. It is very evident that Professor Faraday, not viewing these things from a mathematician's standpoint, uses the word force in a loose unphilosophical manner, sometimes meaning one thing and sometimes another by it. His objection to the completeness of the definition of gravity, because the recognition of the principle of conservation of force (if true) is not implied in it, is about as rational as would be an objection to the definition of a triangle, because the several propositions regarding the equality or inequality of triangles, under certain conditions, are not included in it. Were his principle fairly carried out, treatises on mechanics would consist mainly of definition, and portentous indeed would be the definition that would include all that Professor Faraday requires of it.

It forcibly reminds us of the scene in "As You Like It," where Rosalind, when informed of Orlando's appearance in the forest, says;

> "Alas, the day! What shall I do with my doublet and hose? What did he, when thou saw'st him? What said he? How look'd he? Wherein went he? What makes he here? Did he ask for me? Where remains he? How parted he with thee? and when shalt thou see him again? Answer me in one word."

To which poor Celia, in utter bewilderment, makes answer:

> "You must borrow me Garagantua's mouth first: 'tis a word too great for any mouth of this age's size: to say aye and no, to these particulars, is more than to answer to a catechism."

We must borrow Garagantua's mouth to utter a definition of force that would please Professor Faraday.

If we adopt Newton's hypothesis, is it not natural to suppose that the mechanical action (of whatever kind it be) which proceeds from the attracting body should diffuse itself equally through space, just as light and heat proceed equally in all directions from the sun, although they may meet with no body on which to bestow their influence; if, then, we presume that this mechanical action is

the same in amount in all elementary portions of the same thickness enclosed between two contiguous spherical surfaces, we obtain the law of the inverse square of the distance; and is not this as natural a conservation of force as any that Dr. Faraday could conceive for us? and would not this account, in a very intelligible manner, for the enormous increase of force as the distance diminishes? In the present state of our scientific knowledge we offer this only as a speculation, very probable indeed, but not to be placed in the category of demonstrated physical facts.

The true answer to the Professor's objection is that obvious one which naturally occurs to the mind of the mechanical philosopher, to which our able correspondent "A Mechanic" has already directed attention, viz., that in two mechanical principles the conservation of force, properly understood, is amply recognized—1st. In Newton's Third Law of Motion, that action and reaction are equal and opposite; 2. In the fact that in the existing universe, supposing no new particles or bodies introduced, by creation or otherwise, the sum of the momenta of all bodies measured in any fixed direction is invariable.

By momentum our readers will understand that we mean the product of two quantities, one of which is *proportional* to the quantity of matter in a body, and the other is the velocity with which it is moving at a given instant of time; and our mechanical principle is that, taking any fixed direction we please, and summing up the resolved parts of the whole momentum of every body or particle in this direction, this sum is constant. And even were a new particle or body to be introduced into the system, the whole effect would be to add some constant quantity to this sum of momenta. The centre of gravity of our whole system probably has a motion in space; in fact, observations have given rise to the suspicion that it is moving off at present with a considerable velocity towards a definite quarter of the heavens. It is very probable, though it cannot be demonstrated, that our system, as a whole, stands in some relation to other systems, analogous to that in which the planets stand to each other and to the sun. And when we have once enlarged our views to admit this probability, there is no end to the number of systems which may thus be in mutual relation: yet with regard to all, it may be asserted that the sum of the momenta of all these systems in any particular direction is invariable. In this way we establish a strict conservation, not of force, but of momentum.

To limit our ideas to what regards our own planet: looking upon it as one of the bodies of the solar system, we assert that its momentum at any time is that due to its original velocity, and the action of the several gravitating forces towards the sun and other planets. It is not, therefore, strictly constant, but subject to variation within certain limits.

Nothing, however, that takes place on the surface of our earth affects her momentum as a whole; for here comes in play our other principle, that action and reaction are equal and opposite. It has been well observed, that our only idea of force is derived from its being the means of altering, not the total amount, but the *distribution* of momentum.

Whenever a force is called into play, an equal and opposite force is by the same means generated; and thus the momentum generated in one direction is counterbalanced by an equal momentum in the opposite direction. If a stone is let fall to the earth, there is no less a momentum generated in the earth by the attraction of the stone than in the stone by the attraction of the earth, although the velocity of the earth is insensible on account of its immense mass compared to that of the stone; and it is just as correct to say that the earth is stopped by the stone as that the stone is stopped by the earth. A man cannot rise from a chair, and thus elevate his own centre of gravity, without at the same time depressing that of the earth. And this is true of all forces throughout nature; so that on the whole, although the distribution of momentum is continually undergoing change, by aid of mechanical contrivances, the *whole momentum* of the earth, and of all things on it, is dependent only on its relation to the other bodies of the solar system.

A further difficulty presents itself to the mind of Professor Faraday, arising from the property of bodies called "inertia," which enables them to become, as it were, reservoirs of force, or, as he expresses it, to have "a certain amount of mechanical force stored up in them." This is hardly a correct use of the word force. By the *inertia* of bodies we mean strictly that property by means of which they present no obstacle to the full action of an external force upon them. It asserts that they possess no inherent quality, either to generate motion in themselves or to destroy it when once generated. The consequence of this property is, that a body, when subjected to the continued action of a force, has a continually increasing momentum impressed upon it; and were the force at any moment to cease, the body would move on with the constant momentum it had at this moment. Should, then, after this, a second force act on it in a direction opposite to that of the former,

That there is some broad principle of gravitating action underlying the statement of the law of the inverse square, seems to us to admit of no question; but that when this is discovered, it will necessitate an alteration of the received definition or law of gravity, we by no means admit. To Newton himself, who stated thus broadly his own belief in the existence of som[e] further principle regarding the mode [illegible] action of gravity, we owe the very de[illegible] tion at which Professor Faraday [illegible] Newton and he evidently look at th[illegible] ter from different points of vi[illegible] speculations of the former, in [illegible] quoted, point only to the *mod*[illegible] gravity may be supposed to [illegible] seeks a recognition of a [illegible] conservation of force wh[illegible] we know, never presented [illegible] [ent]irely free the former, at least [illegible] which we have he understands it. [illegible] such instructive please with re[illegible] to assure him, that *operandi* in pr[illegible] acute, unless it the definition [illegible] ideas and habits its multifario[us] [illegible] mathematics alone can must remai[n] [illegible] successfully attempt to

The lea[illegible] truths which demand dently c[illegible] of the mathematician. mechan[illegible] education, or subsequent separ[illegible] into contact with ma- true, [illegible] *Had his early* [illegible] *career, brought him* [illegible] *thematical science,* we can see no reason *why Professor Faraday* should not have *been as eminent as a* mathematician as he *is now as a physicist.* But in the absence *of this special qualification,* he will best *consult the interest of science,* and his own *deservedly high reputation,* by a timely *withdrawal from a course,* his entry upon *which must be a source of the deepest* regret *to his best friends.*

ELECTRIC TELEGRAPHS.

It was with peculiar pleasure that we, who have so frequently brought before our readers the important inventions of Mr. Thomas Allan, and urged their employment upon the public, observed in the *Times* of Wednesday, April 8th, an article upon "Inland and Submarine Telegraphic Communication," in which the merits of those inventions are boldly stated, and the prospect of their speedy adoption upon a large scale is announced. After remarking that "the gigantic undertakings of recent companies, and the gigantic failures which have signalized the efforts of others, have left the public mind in a state of some uncertainty as to the practicability of great ocean lines of telegraphic communication," the writer proceeds to state that, "notwithstanding the popularity of the idea, there has been no great system of telegraphs devised. A scheme, however," he continues, by which we understa[nd] [illegible] [real]ized, which at quantity of matte[r] [illegible] [a]ll *desiderata*, to case, and of th[e] [illegible] [a]nd communication other, are i[illegible] *the* United Kingdom, of time. [illegible] *its* submarine lines the of m[illegible] distant seas." He then sa[illegible] that the plan ought to answer, [illegible] [requi]rements which it is intended [illegible] into the means of telegraphing [illegible] *less* important than the changes it [illegible] *to* effect in the system itself. [illegible] mechanical aids and inventions, *he says,* are the patents of Mr. Allan, who has devoted himself with untiring energy to perfecting the electric telegraph, to the development of which he has applied practically some of the more important recent discoveries of our chief electricians. In nearly every instance in which weighty cables have been laid down in deep seas, either some of the conducting wires have been severed entirely, or when the strain and pressure have been greatest, their insulation has been injured, or they have become attenuated. Mr. Allan has invented a new kind of cable, which, when once seen, is, like breaking the egg, a wonderfully simple solution of the present difficulties. It is a cable about one inch in diameter, the centre of which is formed by 19 wires, of tinned iron wire, twisted into one strand, an inch in circumference. This is enclosed in a case of India-rubber, coated over with a mixture of tar and sand. The cost of the whole is only £70 per mile, and its weight only 8 cwt. The core of this cable is thus made both its strength and its conductor. The conducting power of iron, as compared with copper, is as 24 to 120; but the increased sectional area afforded by the large iron strand more than compensates for the relative difference. But under certain circumstances the strand may be formed of iron and copper mixed, combining the enhanced conductibility of the copper with the strength of the iron. Another great difficulty in submarine telegraphic communication is in getting the electric current along a great length of wire. If we are rightly informed, there are both land and submarine wires going comparatively short distances from this metropolis, to send a message through which requires battery power to an extent that is perfectly amazing, and even then, in damp or unfavourable weather, the needle moves most sluggishly. Mr. Allan meets this difficulty by a novel application of the secondary coil, by means of which he produces an induced current, the great intensity of which is almost equal to the coil of Ruhmkorff. The result of the experiments that have been as yet tried with this apparatus have been in the highest degree satisfactory.

It is proposed by the company that is out to avail itself of these patents to blish, in the first instance, a system of aphic communication throughout the Kingdom almost as complete and as our present postal arrange- t is intended by these to convey all parts of the kingdom at one of 1s. a message, or a penny a spective of distance. For carry- this system Mr. Allan has devised ording telegraph, a great improvement Morse's and Bains's, which, while avoiding the mistakes which, in spite of the utmost care, so often occur with the needle telegraph, can be worked at less than half its cost.

The ocean lines are at the outset to be confined to laying a cable from the Land's-end to Flores in the Azores, and thence to Halifax, making the deep-sea stretch, it is alleged, about 400 miles shorter than the route between Newfoundland and Ireland, and avoiding the land lines, which are expensive to maintain, and therefore create an extra charge on messages between the two termini. From Halifax direct lines already exist, communicating with the Canadas and the United States generally. Future ocean lines will, of course, depend on the shareholders. For the sake of the public and great commercial and national interests, we wish success to the proposed scheme, and hope that the new company, whenever it is formed and at work, may not be deceived in the practicability of their plan, or in its results to themselves.

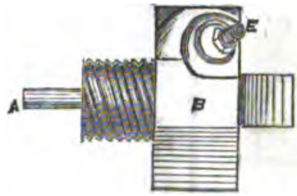
The above is the substance of the *Times'* article, and we need scarcely say that we most heartily join in the hope with which our great contemporary concludes.

AN IMPROVEMENT IN DISCHARGING FIRE-ARMS.

Several attempts have been made to obtain an efficient method of igniting the charge of powder of loaded fire-arms in the front, for the purpose of preventing any portion of the powder being driven out with the ball, and of thus securing the whole effect of the charge. Among the most recent of these is the following invention which has been made by Mr. J. E. Halsey, of New York, United States.

Fig. 1 of the engravings represents a plan of the breech of a rifle with the improvements; and fig. 2 is a longitudinal section of the same with a portion of the barrel, containing a charge, attached thereto. A is a tube fastened into the breech, B, its axis corresponding with that of the bore of the piece, whilst its length is such that it will extend nearly through the charge of powder, C. This tube communicates at its rear end with an inclined tube or passage, D, which opens with the nipple, E, thus forming a

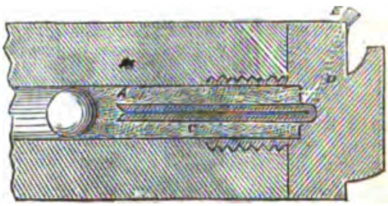
Fig. 1.



continuous tube extending from the nipple to, or near to, the forward end of the charge.

In loading the piece, the tube, A, will become filled with powder, which will be

Fig. 2.



ignited by the cap placed upon the nipple; the fire will obviously be first communicated to the forward portion of the charge of powder in place of to the rear end, as is usually the case.

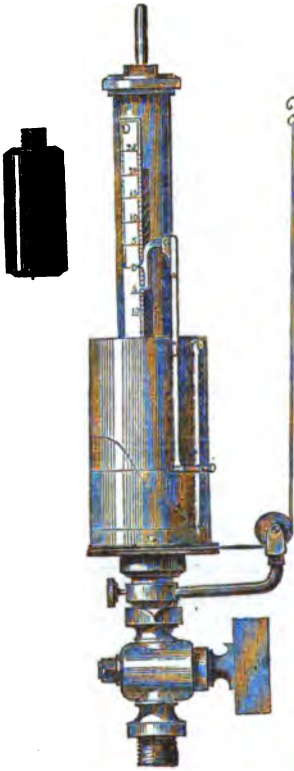
With revolvers, where the nipple is placed in the rear of the barrel and in the same axial line, a mere straight continuation of the nipple tube a suitable distance into the interior of the barrel will form the igniting tube, A. The above arrangements are applicable, with slight modifications, not only to small arms, but to cannon and mortars of almost every description.

EXHIBITION OF INVENTIONS AT THE SOCIETY OF ARTS.

(*Continued from page 343.*)

Before proceeding with the descriptions of the inventions exhibited, we wish to introduce the accompanying illustration of Hopkinson's Steam Engine Indicator, exhibited by Mr. A. P. How (No. 13), and of which a description was given at page 320, of No. 1756.

HOPKINSON'S INDICATOR.

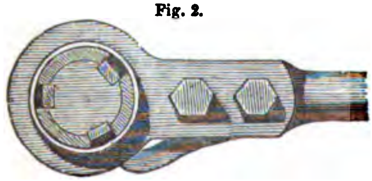


By avoiding the tremulous motion of the pencil, which is generally produced in other indicators, this instrument furnishes the engineer with diagrams which may be relied upon in cases where the actual condition of the engine, or minute alterations in the working parts, are required to be registered.

83. *Ratchet Braces;* A. P. How, Mark-lane.

These braces are shown in the accompanying engravings. Fig. 1 is a sectional elevation, and fig.

Fig. 2.



2, a plan of an inner motion ratchet brace. Fig. 3, is a sectional elevation, and fig. 4, a plan of a continuous motion ratchet brace. The novelties and peculiarities of these ratchet braces may be readily seen by a reference to the engravings. Engineers will perceive that in many respects they offer advantages over others at present in use. Their construction is such that they are light, strong, and

Fig. 1.

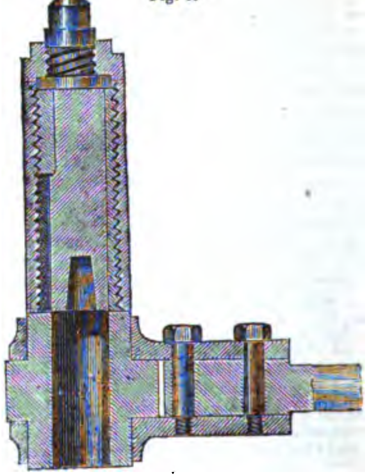


Fig. 3.

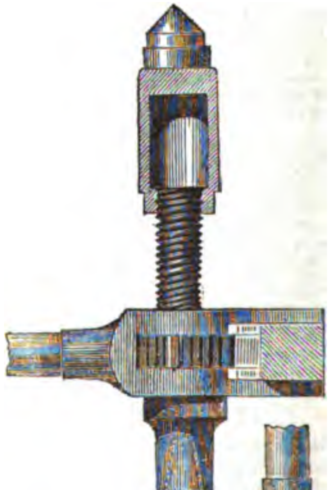
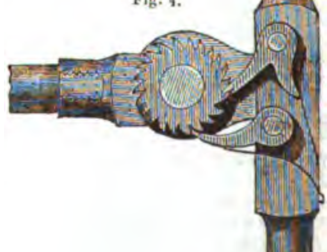


Fig. 4.



durable; and from the extreme simplicity of their working parts, they are little likely to get out of order, or require repair. They offer unusual facilities for the proper adjustment and working of the drill.

84. *Timber-bending Machine;* The Timber-bending Company, York-road, Lambeth.

See *Mechanics' Magazine*, No. 1748, page 46. Specimens of the bent timber are shown, and numbered 84 A.

85. *Artificial Stone, for grinding, sharpening, and polishing;* A. Meillet.

The object of this invention is by a combination of emery and metallic substances, to produce an artificial stone for the above purposes.

86. *Sliding and Screw-cutting Break-lathe;* Wm. Muir and Co., Manchester.

This lathe is a 36-inch centre, the bed being 30 feet long, moveable longitudinally by a screw, to admit a 10-feet face-plate with any object to be turned. The bed has two openings, one to receive the poppet head, and the other to receive the slide carriage and slide rest with tool. By this arrangement the rest does not interfere with the height of centres, and in turning large diameters up to 6 feet the tool slide will be steady, by the rest not overhanging, as is usual in ordinary lathes. The screw is in the centre of the opening, and is supported on bearings on the cross ribs. The power is applied by means of gearing into the internal wheel at the back of the face plate, which can be varied from single to double or treble gear, such gearing being applied to the front of the lathe, where the cutting tools are operating, whereby all strain is taken off the bearing; the reversing motion, clamp nut, change wheels, &c., are applied as in the 12-inch lathe.

87. *Patent Sliding and Screw-cutting Lathe;* W. Muir and Co., Britannia Works, Manchester.

This lathe, which is 35 feet long and with a 12-inch centre, was made for the War Department, and has a new reversing motion for cutting screws, or sliding right or left without changing the wheels; also a new motion for re-boring the tool for screw cutting, two slide carriages and slide rests with a tool to each for cutting screws and sliding rapidly on adjustable stays, a clamp nut with an eccentric motion, and a new support for the screw. The slide carriages have a quick return motion by hand, by means of a rack fixed to the bed, and worked by a handle and wheel. See *Mechanics' Magazine*, vol. lxv., No. 1731, page 337.

88. *Patent Self-acting Traversing Drilling Machine;* Sharp, Stewart, and Co., Atlas Works, Manchester.

This machine is adapted for cutting slots, grooves, key beds, and a great variety of similar work, and may be made either double or single. The machine shown is single.

89. *The Lithotomer or Stone-cutting Machine;* William Williams, Milford Haven.

This machine can be arranged to be worked by hand, and can be made portable, having wheels attached to the bed, and thus can be made useful for ordinary building; or several machines, vertical and horizontal, worked in connection, and driven by steam power, with extra tables, railways, and cranes, may be employed. The machine consists of a traversing bed, upon which the stone is placed. This passes underneath a cylinder, carrying the dressing tools, and thus the upper horizontal face is dressed. By carrying the stone forward under a second set of cutters working vertically, the sides may be dressed, and similarly by presenting other faces, the entire block may be operated upon. The machine is equally applicable, with modifications, to the dressing of curved surfaces.

90. *Improvements in Sugar Mills;* C. J. Lewsey, 7, Albion-terrace, Commercial-road.

This invention consists in the substitution of wrought for cast iron in the head stocks or side frames. The liquor pump gives a continuous stream, without the use of clacks.

91. *Brick-making Machine;* H. Clayton.

This combined mechanical temperer and brick moulder, when worked by a power equal to that of three or four horses, is said to produce from 20,000 to 30,000 bricks per day. In it the pugging and moulding are simultaneously carried out, and the moulded bricks are delivered in a continuous alternate stream from the two ends of the machine.

92. *Patent Elevator and Observatory;* Stocqueler and Saunders, 1, York-buildings, Adelphi.

The intention of this machine is to supersede the necessity for erecting scaffolding, and it is easily managed on level ground by one man. The invention consists principally in a combination of three sets of lazy tongs. See Mr. Baddeley's letter, at page 469 of No. 1736, vol. lxv. *Mechanics' Magazine.*

93. *Improved Apparatus for Making Moulds for Castings;* James Howard, Bedford.

By this method of moulding, the usual processes of jointing, coring, rapping, and drawing the pattern, incidental to hand moulding, are avoided, and the use of skilled labour, in the production of a considerable variety of castings, is rendered in a great degree unnecessary.

93. *Air Blast Flour Mill Grinding-stones;* A. White.

See *Mechanics' Magazine*, vol. lxv., No. 1749, page 145.

95. *Improved Continuous Compressing Machine;* Thomas King, Spitalfields.

This invention consists in arranging two endless perforated bands of articulated bars or links, in such a manner that whilst each works round two drums placed at a distance apart, their faces shall be inclined to each other at an angle in the direction of their length. Thus the space between the faces of the two continuous bands is wedge-like, and any materials placed between them will, when the bands are caused to move from the wide end toward the narrow end, be gradually compressed. In this way tan, hops, &c., may be readily compressed.

96. *Apple and Vegetable Paring Machine;* B. Timmins and Sons, Birmingham.

In this apparatus the apple is fixed upon a fork which is mounted on an axis carrying a screw, to which motion is given by a winch. A curved knife travelling on a guide-rod is brought into contact with the article to be pared by means of a lever working in the thread of the screw. A second lever at right angles to the arm carrying the cutting blade, traverses an irregular inclined plane, thereby increasing the distance between the centre of the article and the knife.

100. *Biddell's Patent Hand-Power Steel Oat Mill.* Exhibited by Ransome and Sims, Ipswich.

This mill, uniform with Biddell's Patent Bean-Cutter, is well adapted for bruising oats for food. The roller which cuts the oats has the cutting edge of pure steel which is supported at the back by cast iron. This enables the manufacturer to harden the steel as much as can be done by fire

and water, and the cast-iron not being susceptible of hardening by the same process, the toughness of the soft material supports the keen-cutting edge of the harder metal.

101. *Biddell's Patent Bean Cutter.* Exhibited by Ransome and Sims, Ipswich.

The novelty of this mill consists in the teeth or cutters being made of separate pieces of hardened steel, fixed in a cylinder; each tooth has three prepared cutting edges, so that when one edge, or set of edges becomes dull, they may be taken out, turned one-third round, and put in again, and a new edge, or set of edges is obtained; and when these fail, they may be again taken out and turned one-third round, and it makes a second fresh set; and when this third resource fails, they may be taken out and easily replaced with new teeth.

102. *Patent Cattle Food Preparer;* B. Samuelson, Britannia Works, Banbury.

This machine consists of a combined root grater and chaff-cutter, so arranged on the frames that the cut chaff and roots are intimately mixed as they leave the knives and fall through the same spout. The mixture taking place while the grated root is in a wet state, is more complete than if the chaff and roots are cut separately, and afterwards mixed by hand. Turnips or chaff can be cut separately if required.

103. *Patent Root Pulper;* E. H. Bentall, Heybridge, Maldon, Essex.

This pulper has knives or hooks set in a helical form round a barrel, in front of which a worm is placed of the same pitch as the screw on the barrel; on the shaft of each a cog wheel is fixed, and these gear into each other; consequently, when the barrel is turned, the knives on the barrel pass through the worm. This arrangement overcomes the chance of clogging, even with the hardest and toughest roots. Should an accident occur to the knives, they are easily replaced, without even taking the barrel out of its bearings.

105. *Patent Prize Haymaking Machine, with reverse action;* H. A. Thompson, Lewes.

In this machine the improvements are—1st. The adoption of solid axles revolving in bearings. 2nd. The application of adjustable bearings. 3rd. The form of the tine, or prong, of the fork heads. By the patent double tine a perfect curved tooth is retained for tedding, together with a radial tooth, best adapted to scatter the hay in the lightest manner when used in the back action. The machine also possesses several other peculiarities.

106. *Patent "Percolator" Fork;* E. A. Athawes, Blackfriars-road.

This fork is convex in the front; it has four tines, the two central tines projecting beyond the two external ones, and a new and peculiar arrangement of the cross-piece or head. It is intended to supersede the use of the common hoe, and the horse hoe, which simply lighten the surface soil, whereas this instrument penetrates to a great depth.

111. *Improved Fire-arms;* Colonel Colt, 14, Pall Mall.

See *Mechanics' Magazine*, vol. lxv., No. 1739, page 529.

112. *Patent Holster, Belt and Cartouche Box;* C. F. Dennet, 14, Pall Mall.

The belt is made of black patent leather, and the fixture is water-proof; attached to the belt is the holster and the cartouche box. The receptacle for the caps and cartridges consists of a japanned metal box and lid, enclosed in a leather pouch, the flap of which is fitted with a tongue to button on to the stud. This belt saves 8lbs. in weight.

115. *Machine for Ascertaining the Propelling Force of Gunpowder;* Thomas Austin, Waltham Abbey.

See *Mechanics' Magazine*, No. 1756, page 313.

116. *Short Cannon;* Captain J. Norton, Rosherville.

This cannon is without a touch-hole, and is fired at the mouth by friction. The object in view is the destruction of wild beasts. This is effected by attaching a bait to a plug at the mouth, which, when seized by the animal, causes the charge to explode.

120. *Patent Magnetic Disperser for Chronometers;* E. D. Johnson, Wilmington-square.

The object of this apparatus is to give such motion to the chronometer as may obviate the effects of local magnetism. The instrument and its gimballing are so mounted that it revolves in the planes of the balance once in twenty-four hours.

121. *Prismatic Clinometer;* W. Pole. Exhibited by Elliott, Brothers, 56, Strand.

This instrument consists of a prismatic compass, with the addition of a weighted dial, for the purpose of taking vertical angles.

122. *Patent Planimeter;* Amsler, Switzerland. Exhibited by Elliott, Brothers, 56, Strand.

This is an instrument for calculating the areas of plans, maps, &c., with perfect accuracy.

123. *Spherograph, for laying down Courses in Great Circle Sailing;* —. Gerard.

This spherograph has been approved by the Lords of the Admiralty. In addition to the chart, a ruler and index is employed. In using the ruler one of the corners at the end to which the index is attached, must be laid on the chart, and the other corner of the same edge on the point specified on the circumference. The ruler is then to be held fast, the nut slackened, the index point brought to the required position, and clamped by tightening the nut.

124. *Patent Portable Globe;* J. Betts, 115, Strand.

This globe is composed of a steel wire frame, covered with a map, printed on cloth. A steel tube forms the axis, which is surrounded with wire ribs very slightly curved in the form of a bow, and one end of each of these is fixed near to one end of the tube. The other end of each of the ribs is attached to a slide or runner, similar to that of an umbrella.

125. *Patent Barometers;* Gwynne and Co., Essex-wharf, Essex-street, Strand.

This invention consists chiefly in supporting or balancing the instrument on points, pivots, or knife edges, or suspending it by a flexible material, as a silken cord, a fine flexible steel spring, &c., which allows the instrument to vibrate or oscillate freely, and a pointer or hand fixed to the instrument, and moving in front of an index or dial, shows, by its motion, the most minute change in the atmosphere. Any increase in the pressure of the atmosphere forces the mercury or other fluid up the tube, as in the ordinary barometer; this increased weight (equal to the quantity of mercury or other fluid) moved to the opposite side of the point of suspension causes the instrument balanced on its point, or otherwise suspended, to move, and the indicating hand shows the change: a decrease in the pressure of the atmosphere affects the instrument in the opposite direction. A great many varieties in the arrangement of the instrument can be made.

128—135. Under these numbers, Messrs. A. and J. Rigg, Juns., exhibit a series of models for aiding teachers in teaching perspective, the action of steam engines, &c., &c.

137. *Machine for Measuring Distances;* Commander Rodd, R.N., Bideford.

This instrument is so arranged that the wheel

which gives motion to the index pointers, also brings into action the letters T and H placed in the top of the instrument, which letters rise and fall at the completion of every ten or one hundred yards respectively, thus obviating the necessity for constant reference to the dials. The maximum distance registered by the dials is ten thousand yards.

138. *Patent Micro-Photographic Reflecting Process;* Specimens by W. H. Olley, 2, Brabant-court.

By this invention, the principle of which consists in the application of the camera lucida and other reflectors to the eye-piece of the microscope, the most faithful photographic representations of microscopic objects can be obtained in a few seconds or minutes.

139. *Patent Artificial Ivory Photographs;* J. E. Mayall, Regent-street.

Artificial ivory is adapted by Mr. Mayall for the reception of the photographic image. This may be rolled into slabs of any size, which when polished have a fine texture, combined with the semi-transparency of ivory.

140. *Patent Spring Camera Shutters;* T. Skaife, Vanbrugh House, Blackheath.

Photographers, when attempting to photograph moving objects, experience difficulty in raising and depressing the ordinary dark slide or in removing and replacing the cap of the lens sufficiently quickly. These shutters obviate that difficulty; they are made chiefly of hard India-rubber, commonly called "vulcanite," a substance not affected by change of climate or photographic chemicals. The shutters are impenetrable to light, and combine the strength and truth of steel with the lightness of papier maché, occasioning no perceptible vibration to the camera in their working, though fully opened and closed in the fifth part of one second, which can be done by a slight application of one finger.

141. *Electro-Chemical Bath;* J. I. F. Caplin, M.D., 9, York-place, Portman-square.

The object of this bath is to remove from the system any particles of metal which may have been absorbed by it.

143. *Patent Trito-Dactylo-Gymnast, or Third Finger Exerciser;* William Prangley, Salisbury.

This instrument consists of an adaptation of springs attached to the wrist, and held in position by finger caps, and is intended to be worn while practising on the piano, &c., so as to render the third finger equal to the others in power and activity.

152. *Patent Corrugated Papier Maché;* Healey and Allen, 301, Strand.

These sheets are prepared of various thicknesses, the corrugations being proportionate to the thickness of the sheets and quality of the material. They are rendered both waterproof and uninflammable, that is, they can be charred, but no flame can be produced. The sheets are made of various sizes, suitable for the exterior walls or interior lining of portable houses, also for partition, panelling of furniture, doors, &c. They are also suitable for the sides and divisions of railway carriages, and for all kinds of roofing, the sheets being curved to any radius required. The thinner sheets are also applicable to a variety of useful and ornamental purposes, as boxes, screens, &c., &c.

153. *Patent Siliceous Stone;* F. Ransome, Cannon-row, Westminster.

See *Mechanics' Magazine*, No. 1748, page 126.

154. *Patent Improvements in the Process of Preserving Stone;* F. Ransome, Cannon-row, Westminster.

Specimens prepared as follows, viz.:—The stone is first coated with a solution of silicate of soda, and then with a solution of the chloride of calcium; the result is, the formation of an insoluble silicate of lime in the pores of the stone, filling in every vacuity, and thereby preventing decay from the action of the weather in and on the substance.

156. *Imitation of Stained Glass;* Henry Myers, M.D., 60, Upper Charlotte-street, Fitzroy-square.

This invention consists in the use of sheets of gelatine, upon which the designs are painted in mineral pigments. The sheets are then placed between two sheets of glass, and fixed in the usual manner.

158. *Patent Process for Coating Iron with Copper and Brass.* William Tytherleigh, Birmingham.

The principle of the process is analogous to that of soldering, the difference being that the granulated metal is spread over the surface of the iron, instead of being merely applied to the edges.

160. *Patent Gutta Percha Prize Skates;* Parker and Thompson, 20 and 22, Rockingham-street, Sheffield.

The principal advantages of these skates are, lightness, cheapness, improved shape, great strength, and durability, combined with novelty and richness of appearance.

161. *Patent Skates made by Machinery;* F. Thompson. Exhibited by Parker and Thompson, Sheffield.

This invention consists of a support for the foot obtained by using a narrow piece of wood, of uniform width, in which is inserted large circular or oval shaped plates, to support the heel and ball of the foot, these plates at the same time answering the purpose of nuts working upon screws inserted into the irons and passing through the wood, thereby securely fastening the whole together. The process is so simple and expeditious, that with only two machines 800 pairs of skates per day can be produced, at a cost considerably less than half the ordinary price. See *Mechanics' Magazine*, October 4th, 1856, No. 1730, page 315.

162. *Patent Universal Lock;* M. L. Parnell, 283, Strand.

This lock is so formed, that pressure obtained against the bolt, with any other instrument but its proper key, entirely stops the action of the levers. See *Mechanics' Magazine*, No. 1754, page 272.

163. *Patent Ball Caster;* Bird and Scott, Manchester.

The novelty consists in the weight of the article to which the casters are attached resting upon the peripheries of two spheres revolving together instead of upon one as heretofore.

164. *Patent Pneumatic Bell;* William P. Maddison, Barnsley, Yorkshire.

One end of a tube is fitted with a small cylinder and piston which are not air-tight, to the top of the rod of which is fixed a small weight or hammer, and above it is placed a bell. To the opposite end of the tube is attached an India-rubber ball, the quick compression of which causes the piston and hammer to rise quickly, and strike the bell placed above it, any number of strokes being given as may be required. The novelty consists in the fact of the cylinder and piston not being air-tight, which allows the air in the tube to be at all times of the same density as the surrounding atmosphere.

167. *The Poor Man's Candle;* W. Little, 198, Strand.

This lamp is intended for burning bituminous or paraffine oils. A large solid wick is employed, combustion taking place only on its surface; this prevents the diffusion of unconsumed carbon and the charring of the wick—it being stated that one wick will last twelve months.

174. *Patent Union Gas Stove;* George Neall, Birmingham.

This invention consists in placing the burners below an oval dome of glass, and so combining light and heat.

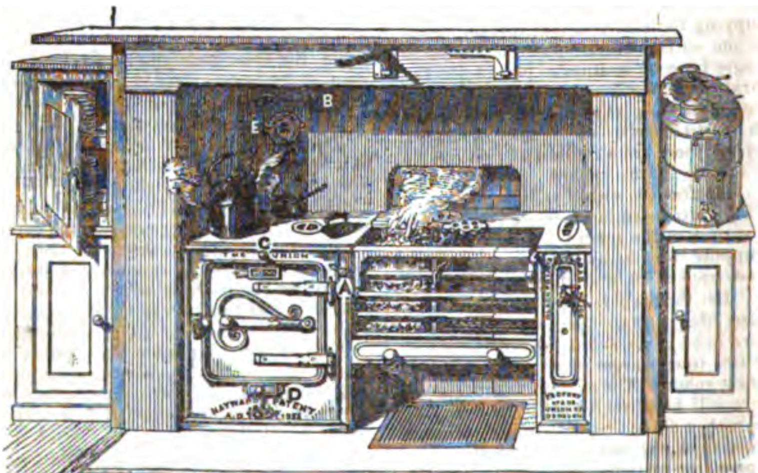
181. ***Stainton and Davey's Patent Fuel Stove.*** Exhibited by Deane and Dray, 1, Arthur-street, London-bridge.

This stove is applicable to the economical combustion of coal, coke, or other material, including inflammable gas. In the construction or arrangement of the stove to be used for the combustion of coke, coal, and such like fuel, great heat is obtained in the grate, basket, or fire-pan underneath a fuel or feed chamber (and in the stove for gas in the combustion chamber), whence the heat ascends through one or more shafts or flues to the top or hot-air chamber, from which the heat descends and circulates within the body of the stove around the fuel chamber (in the gas stove around the air shaft), whence the products of combustion pass off into the chimney or exit flue without sensible loss of heat, whereby the combustion or the heat resulting from the combustion is greatly economised. Gas can be used in this stove without the modifications alluded to. Except in the stove as preferred to be used for the combustion of gas, the fuel chamber is immediately above the grate, fire-pan, or basket, which can be charged with a sufficient amount of fuel to last a given time, according to the capacity of the stove, so that when the fuel has once been well lighted, no further attention will then be required.

182. ***The Union Kitchen Range with Open Fire;*** Hayward, Brothers, 117, Union-street, Borough.

The advantages of this open fire range are, that in it the heat can be directed to the top of the oven, or equally to the top and bottom at the same time; and in either case, the whole of the hob above the oven presents a boiling surface or hot plate, of sufficient power to heat steaming apparatus, saucepans, kettles, stewpans, for frying or preserving. The hob may also be used as an ironing stove. The oven will take without any setting whatever. It may be on either side of the fire, and can be kept "slow" if required, but the temperature can be raised at pleasure, and kept at any point for baking bread, or up to a "quick" and scorching heat for roasting meat, which, if occasionally basted, cannot be distinguished from that which has been placed before the fire. The usual size of the oven is about 16 inches square, but much larger are made if required. The boiler is, in appearance, like that of an ordinary range, but its peculiar shape gives great power for steaming or for heating large quantities of water for baths, hot water pipes, &c., &c. The oven is encased, leaving a flue or space all round, into which, (through a recess in the oven cheek) the heat from the lower part of the fire is admitted, instead of being lost, by passing upwards to the chimney in the ordinary manner. The direction of the heat is governed by a handle which is attached to a flap working in the space between the oven and the fire. The amount of heat is regulated by the damper, which should be drawn out about three inches when the hot plate or the oven is required; and if the heat should then become too great, the draft must be diminished by pushing the damper farther in again, and the intensity of the heat will thus proportionably diminish. A very small fire is sufficient to heat the oven, hot-plate, and boiler; but the fuel should always be high enough to cover the top of the opening in the oven cheek, and kept well into the recess, so that the fire shall not burn hollow in this part, otherwise cold air will be admitted into the flues and check the oven. A large fire is only required for roasting in front of it. Should the flue above the hot-plate require clearing, it is done by passing the flue-brush upwards and downwards through the circular door, but this is seldom required, excepting when the chimney is swept.

HAYWARD'S UNION RANGE.



183. ***Pneumatic Moderator for Chimneys;*** W. G. Wilson, 13, Princess-street, Little Queen-street.

See *Mechanics' Magazine*, Vol. lxv., No. 1722, p. 126.

(To be continued.)

THE CONSERVATION OF FORCE, AND THE GRAVITATION OF MATTER.

To the Editor of the Mechanics' Magazine.

SIR,—Professor Faraday teaches in your pages that "force can neither be created nor destroyed." He believes force to exist, but he argues that "the conservation of force is a fundamental principle." He says, "The usual definition of gravity as *an attractive force between the particles of matter varying inversely as the square of the distance*, whilst it stands as a full definition of the power, is inconsistent with the principle of the conservation of force."

With your permission, Sir, I will endeavour to treat of gravitation in a different way. Thus:

The sum of the effects of the gravitating force producible from the same particle with any given radius of action, is ALWAYS THE SAME, *whatever may be the length of the radius.*

Suppose a single particle of matter. Surround it with a hollow sphere, the particle occupying the centre of that sphere. Suppose the surface of the sphere to consist of a single layer or stratum of particles. The central particle will exercise an attractive force on all the particles in the sphere, and each particle will be equally attracted. Suppose there are a million of particles in the surface of the sphere. Each particle will be attracted with a millionth part of the total attractive force exerted on the entire surface of the sphere.

Suppose we do away with the sphere already spoken of, and substitute a larger one. Let the particle before spoken of still occupy the centre. Suppose this second sphere to be of such a size that it has a surface 100 times larger than the surface of the first sphere. The surface of this second sphere will be attracted to the central particle with a force equal to that which was exerted upon the surface of the first sphere. Suppose the particles in the surface of the second sphere to be of the same size as the particles in the surface of the first sphere. There will then be 100 times as many particles in the second sphere as in the first. As the total amount of attractive power exerted by the central particle is the same in the second sphere as in the first, while the number of particles is increased a hundredfold in the second instance, each particle in the second sphere will undergo only a hundredth part of the attractive power which was exerted on each one of the particles in the first sphere. Thus so far as the individual particles are concerned, the attractive power in the second sphere is diminished a hundred-fold; but so far as the total number of particles is concerned, the power is the same in one sphere as in the other.

We have said that the attractive power exerted upon each particle is 100 times less in the second sphere than in the first. This follows from the fact that the surface of the second sphere is 100 times greater than that of the first sphere, and from the principle that the power of the central particle is unvarying. It is also to be observed, that in order for the second sphere to have a surface 100 times greater than that of the first, the second sphere must have a diameter ten times greater than that of the first sphere. Thus the semi-diameter, or radius of the second sphere must be ten times greater than the radius of the first sphere. Therefore, the particles in the surface of the second sphere are ten times further from the central particle than are the particles in the surface of the first sphere. Thus the distance at which the attractive force is exercised, is ten times greater in the one case than in the other, and the force exerted on each particle is 100 times less in the one case than in the other. Sir Isaac Newton expresses this deduction by saying, that "particles attract each other with a force varying inversely as the square of the distance."

However small may be the first sphere, and however large the second, the same law holds good,—the total effect is the same. The first sphere may be an inch in diameter, and the second may extend to the very verge of creation. But the greater the radius, the greater the surface, the greater the distribution, and the less the intensity. The same may be said of all radiating forces, heat, light, electricity, &c.

The law which is enunciated above, includes the Newtonian law of gravitation, and Faraday's law of conservation, the force between given particles being proportioned inversely to the square of the distance, and the totality of the power being without variation.

I have in a former article ("Facts and Fancies") objected to the word "attraction," except as a convenient word to express a theory. I have argued that attraction is not an ascertained fact, and that the real ascertained fact is simply this, that particles free to act are seen to *approach* each other. *Why* they thus approach each other is a question. We imagine the existence of an attractive force, and the theory may be a convenient vehicle of thought. The theory may be found to agree with the appearances of things. But when we inquire—"What is force?" we go beyond appearances, and inquire into the nature of that which is only known by its effects. We know that par-

ticles attract each other. But why do particles thus act? Because there is a force applied. What force? Attraction. What is an attractive force? If we know not the noun, shall we know it the better when coupled with an adjective? If a man were found utterly ignorant of what was meant by the word "steam engine," would he be able to say what was meant by a "high pressure" steam engine?

What then shall we understand by the word force? Motion and matter are distinct, for matter is matter though it have no motion. If matter moves, why does it move? Because something moves it? We may be told that particle Z is moved by particle Y, and that Y is moved by X, and X by W, and so on; but long as the chain may be, there must be an end to it, and as there is motion through the entire length of the chain, what is it that moves our A? Omega moves because Alpha moves, but what moves Alpha? Is it not a reasonable conclusion that there is a First Cause, and that He who created matter also creates motion? Is it not reasonable to say that matter never originated motion, and that matter moves because moved by spirit? As the effects are, so is the cause. As the effects are unvarying, so is the cause unvarying, and of that Great First Cause it may be said—"Thou art the same, and Thy years shall not fail." All we know of force is this—that it is invisible, universal, and unvarying, and, therefore, I say it is God himself. The laws of its action we may discover; its nature never.

I am Sir, yours, &c.,
JOSEPH PITTER.

254, High-street, Borough,
London, April 6, 1857.

PUBLIC CLOCKS.

WESTMINSTER v. CLERKENWELL.

To the Editor of the Mechanics' Magazine.

SIR,—The personal recriminations and point-blank contradictions of Messrs. Denison and Loseby in your late number, like everything else connected with the *Westminster clock*, is a disgrace to the age and country in which we live. These two parties may well be left to their fate, probably that of the Kilkenny cats; but your last number (page 326) contains the Saxon remonstrance of an injured artizan that is highly suggestive, and worthy of passing comment. In any country in the world, England only excepted, if a superior clock, or other piece of mechanism had been wanted for a national purpose, the most celebrated and skilful of the native manufacturers (if competent) would have been called upon to furnish it. In England, alas! if such an article is required, it is sought for among those whose principal, if not sole recommendation, is that they only know how "*not to do it.*" If the result should approach to mediocrity, the fortunate designer is self-laurelled, and self-trumpeted *satis superque*; but should the desired standard be fallen short of, the failure is placed to the account of some sorry scape-goat.

I remember that when a clock was wanted for the new Royal Exchange, it was ordered of a *watchmaker*, who had neither the workshops, tools, workmen, nor experience necessary for the occasion. However, the workshops were built, the tools were provided, and the workmen obtained, by tempting them with "constant employment at higher wages." The skill of the workmen, however, did not extend much higher than their fingers, and the experience had to be bought; and, according to a familiar proverb, the dearer the better!

The result, in this instance, of the "'prentis hand," like that of many other amateur performances, fell much below the mark; and the unlucky bell-founder was, to some extent, made the scape-goat. At any rate, the Royal Exchange clock has been the subject of so much bitterness, that it has now become, by common consent, a tabooed topic.

"Oh, no we never mention it, the chimes are never heard,
Our lips are now forbid to speak that once familiar word."

But, *experientia stultum docet*; when the civic authorities required another clock (for their new cattle market), they did not again give an order to the Royal Exchange watch-maker, but handed it over to Messrs. Moore and Sons, of Clerkenwell Close; and, as a necessary consequence, and quite in the regular course of business, the Committee got exactly what they required; that is to say, a first-rate clock, without any difficulty, delay, or cause for dissatisfaction. And, by the bye, there is, among many others, one peculiarity of the Islington Cattle clock which, to my mind, strikingly illustrates the bungling of Messrs. Denison and Co. as contrasted with the practical experiences of half a century by the Clerkenwellians, namely, that the motion-work to carry the hands is considerably larger than that of the Westminster clock, although the dials of the latter are nearly double the size of the former. It is true the Islington clock has no "Big Ben" to strike upon, but the weights, power, and proportions of the parts, and of the bells, are in every way judicious,—a statement that can never be truly made of the Westminster horologe.

I can safely assert, without the possibility of contradiction, that should the present clock ever be completed and placed in the Palace at Westminster, it will still be greatly inferior in character, although greatly superior in cost, to the clock of the Metropolitan Cattle Market!

In "Some Considerations on the Subject of Public Clocks," published long before the Westminster clock was thought of, there occurs the following pertinent remark:—"Many of the church clocks of the present day are in no respect better made than they were fifty years ago, but the contrary; for, in some particulars, many of the new clocks are inferior, especially in the quantity and quality of material employed. Some clocks of the present time are made of *cast iron*; but the durability of such clocks is very doubtful. The object of the parties employing such material is accomplished by being able to produce an article at a lower rate, and with much greater profit, than those who employ the best material, such as gun-metal or brass, the former being by far the most durable."

That the Westminster clock displays great want of judgment, both in the choice of material, and in the proportion of its parts, is the *opinion* of most experienced horologists. That such is a *fact*, seems to be well nigh proved by the extensive tinkering which is now found necessary.

When the semi-barbarous emperor of China wanted a large clock for Canton, he well knew where to get it. He sent his order direct to Clerkenwell, and obtained an article to his entire satisfaction; while our Barnacles at home appear to be living in blissful ignorance of the existence of any such locality, or of the world-wide celebrity of its handicraftsmen!

In speaking somewhat pointedly of Messrs. Moore, I merely refer to them as a type of their craft, of which they may well be regarded as the head, seeing that during the present century upwards of five hundred large clocks have issued from their manufactory, and there is scarcely a spot on the habitable globe where the traveller does not meet with the household words, "John Moore and Sons, Makers, London."

Mr. Denison and Co., seem to carry on their experiments upon the principle of "Never mind what's to pay, the public pays for all;" but as one of the paying public, I hope to see the day, and not far distant, when the product of their lucubrations will be condemned to the old iron shop, and a clock worthy of its destination ordered for the Palace of Westminster, from some experienced maker.

Messrs. Moores state (at page 327), their willingness to supply a *better clock* for *less money*, and their position is a sufficient guarantee for their doing so if called upon.

I am, Sir, yours, &c.,

Wm. Baddeley.

Angell-terrace, Islington, April 7th, 1857.

To the Editor of the Mechanics' Magazine.

Sir,—Permit me a corner in your valuable Journal, to record what I conceive to be a case of Denison and others *versus* Horological Craftsmen.

In reference to the important subject of horology, particularly in connection with the Westminster clock, I have felt, in common with others, the indignities and aspersions that have been cast upon our craft, and have witnessed the anomalous position of the science of clock-making, as represented to the public in various statistical and Governmental documents, as well as in Mr. Denison's treatise on clock-making.

Through these mediums Mr. Denison, as a good representative of his craft, has egregiously erred in his misrepresentation of facts during the whole of his career as caterer for distinction in the important capacity of theoretical as well as practical clock-maker to the Palace of Westminster. In regard to the science of clock-making, I am constrained to say that my experience compels me to admit that for many years no constructive improvements of any notable character have been adopted in this country until recently, and those not original; in fact, it may be said with truth that our horological handicraftsman has indeed observed a dogged indifference to improvements, as well as a tenacity for old forms and principles. Even in our largest and presumed best clocks, we find forms of framing that any tyro in engineering would dismiss from his mind at once as untenable. And in regard to the wheel work, or train, little has been adopted to secure first-class scientific principles.

Such a state of things, coupled with the torpor that has characterised the members of our trade for so long a period, need leave us a very little astonished that a man, an advocate of law of this country, should spring up and appropriate, as the birth of his own brain, what really and ostensibly belongs to another country.

In reviewing, as I have at different periods, the Parliamentary Papers relating to this Westminster clock, I find nothing described therein that is new. Mr. Denison and his colleagues' design, plans and details may be witnessed in nearly all the clocks in France, as well as many in Germany. In this almost interminable question the public will have little to thank Mr. Denison for, except the influence of his natural snip-snap in awaking the latent

talents of those engaged in horological pursuits.

As one who is fearless of the consequences of innovation, I cannot help feeling umbrage, in common with our profession, that Mr. Denison and his cotemporary Dent should decorate themselves before the public with so much approbation, assuming that they, and they alone, are the only capable persons in horological matters of magnitude.

I look upon Mr. Denison as a man in office in this matter, and like most government officials, whether competent or otherwise, he has wielded his influence for his own special behoof, as almost every official letter is transparent with self, showing clearly that the latent talent existing in the trade was never intended, from first to last, to be identified with that noble *recherché* structure, that every Englishman must be proud of.

Doubtless, the government commissioners have erred, as is most frequent with blue books, as well as red tape, in allowing Mr. Denison to appoint himself chief horological executor to the Palace of Westminster. Probably the craft our executor emerges from entitles him to silence with his own noise the superior attainments to be found connected with this profession.

And I hesitate not in affirming, that if Mr. Denison had used his pen and influence towards our horological professors with upright English spirit, and with monetary fairness, plans, drawings, and descriptions of clocks, would have been awarded to the nation immeasurably superior to the one contemplated, and with a practical result much more satisfactory than now.

I do not anticipate, after the vaunting that we have been subjected to, that the making of the clock will be submitted to the trade, as suggested by your correspondent of the 25th March, but assuredly if assistance were required, it would be attended with better results than those emanating from the considerations of an amateur.

The conclusions I draw from this controversy, judging from the antecedents of Messrs. Dent and Denison are, that the benefits that may arise may be just these, that our eighteen hundred pounds the nation will have to pay, and for this monopoly of legal (or illegal) intellect they may be compelled to enlist the co-operation of engineering talent that will lay aside the mere fantasies of a theoretical scholar. I am, Sir, yours, &c.,

THOMAS LEONARD.

Church, Turret and Astronomical Clock Manufacturer and Mechanician, 50, Tabernacle-walk.

April 14, 1857.

INDIA RUBBER AND ITS ADULTERATIONS.

To the Editor of the Mechanics' Magazine.

SIR,—In your last impression, on the subject of "Invalid Mattresses," there is a slight error in the wording over the *last line* of figures. "It should be *retail profit on each*," (not *retail price*). Your correction will oblige, Sir, yours, &c.

W. H. HERBERT.

April 12, 1857.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

HOFFMANN, P. P. *An improved compound to be used for waterproofing fabrics, paper, leather, or other materials.* Dated Aug. 16, 1856. (No. 1920.)

Coatings are produced from either a mixture of siccative linseed oil and sulphur—balm of sulphur—or of a mixture of balm of sulphur with a quantity of siccative oil, gum copal, gallipot, yellow amber, resin, litsphalt, India rubber, and gutta percha, and with the essences of turpentine or naphtha, &c. The invention also comprises modes of preparing the balm of sulphur.

JOYEUX, L. A. *Improvements in obtaining motive power.* Dated Aug. 16, 1856. (No. 1921.)

This relates to the combined use of steam and air to obtain a motive power. It comprises a generator, an engine, and a regenerator. The generator is composed of a furnace, an ordinary boiler furnishing the steam, and a series of tubes independent of each other, which heat the air used in producing the motive power. The engine consists of an ordinary engine receiving the motive gases producing the power to be used, and actuating a blowing apparatus which injects air into the tubes placed in the furnace. The regenerator is composed of metallic pipes, through the interior of which the air passes as it enters the blowing apparatus for feeding the hot air generator.

SCOTT, T. *Improvements in cooking.* Dated Aug. 18, 1856. (No. 1923.)

This consists of a mode of cooking by the agency of steam. The vessel used (for boiling) is formed of a double casing or jacket, so that there is a thin enclosed space round the vessel. This space is fitted with a mouth-piece upon the end of a steam pipe, communicating with any suitable steam generator. When the vessel is filled with the matters to be boiled, the steam is admitted into the vessel, and the contents are cooked in a rapid manner.

TYTHERLEIGH, W. *A new or improved manufacture of rollers or cylinders for printing fabrics.* Dated Aug. 18, 1856. (No. 1924.)

This consists in coating an iron cylinder with copper or alloy of copper, and afterwards fusing thereon in a mould, or filling the mould with fused copper or alloy of copper, or in attaching a tube of copper or copper alloy to a cylinder of iron in its interior, by a solder more fusible than the copper or alloy of copper.

NEWTON, W. E. *Improved machinery for cutting and finishing metal screws.* (A communication.) Dated Aug. 18, 1856. (No. 1925.)

A slide rest, having a slide cutter tool working thereon, and combined with a hollow box, into the axis of which the end of the wire to be operated upon is inserted, and is shaped and finished by the cutting tool. With the box is combined, for holding and supporting the end of the wire, a set of snap dies for cutting the threads of the screw; and, lastly, the slide cutter rest and slide cutter tool are combined with the box for holding the wire and dies for cutting the threads upon the screw before they are detached from the stump of the wire.

NEWTON, W. E. *Improved machinery for forging or working iron and other metals.* (A communication.) Dated Aug. 18, 1856. (No. 1927.)

This comprises a method of applying the hammers, a method of constructing the anvil, so as to have a face which forms the interior of an angle, and in a mode of combining the anvil with the hammers so that they may operate at an angle to each other; also, in the arrangement of a moveable carriage or rest to move the piece of metal as required by the alternate strokes of the hammer.

STOPPERTON, J. *Improvements in propelling vessels.* Dated Aug. 18, 1856. (No. 1928.)

This consists in the use of surfaces which in one direction of their motion present a surface to act directly on the water and propel the vessel, but in the opposite direction, being hinged and jointed, open, and permit the passage of the water.

BROOMAN, R. A. *Improvements in stopping or retarding railway carriages and trains, and in preventing carriages running off the lines.* (A communication.) Dated Aug. 18, 1856. (No. 1929.)

This has for its object—1. Effecting the stoppage of railway trains by the application of friction to the rail by hand-wheels, winches, or cranks separately applied upon each carriage. 2. The application of brakes so that the momentum of the carriage may check the speed. 3. Their application as a combined support and brake in case of fracture or breaking of an axle, or the disengagement of a wheel or other part.

HOW, A. P. *Improvements in pumps.* Dated Aug. 18, 1856. (No. 1930.)

This invention was fully described and illustrated at page 409 of No. 1734.

CHOUILLOU, C. M. *Certain improvements in thinning or shaving tawed, tanned, or dressed skins.* Dated Aug. 18, 1856. (No. 1931.)

A tool is made to rotate and remove, by friction or cutting, any inequalities or superfluous thickness that there may be on skins, this rotating tool being used instead of the to and fro action of a blade or cutting instrument worked by hand.

LEACH, J., W. TURNER, and J. TEMPEST. *Improvements in rollers, applicable to condensing and all other kinds of engines, for carding wool, cotton, and other fibrous materials.* Dated Aug. 19, 1856. (No. 1932.)

Claim.—The covering of rollers with bristles or other flexible material, either in a straight or sloping direction, in contradistinction to wire cards, and the use or application of the said brush rollers as doffing or stripping rollers to strip the fibrous material from cards, either in connection with the common doffing combs or for stripping and doffing wool, &c., without the comb being used, the said doffing roller being applicable to condensers and all other kinds of carding engines.

NOYER, P. *Winding up fusee watches and pocket chronometers, and setting the hands without key.* Dated Aug. 19, 1856. (No. 1934.)

A description of this invention requires engravings to illustrate it.

BURDEN, H. *Improvements in machinery or apparatus for manufacturing shoes for horses, mules, and other animals.* Dated Aug. 19, 1856. (No. 1936.)

A machine is used for manufacturing shoes from bar iron as it is discharged from the rolling mill without reheating. The bars are rolled square, and are placed (upon leaving the mill) into a trough in connection with the horse-shoe machine. Then a portion of the bar is first drawn into the machine and cut off; it is then bent around a mould into the shape of the letter U. The heels are then bent further inwards, whilst it is next passed between two revolving swaging dies that compress and roll it into its proper form. It is then creased or grooved, and punched, and finally taken from the dies, flattened, and dropped finished upon a travelling belt that conveys it to the storehouse.

JOBSON, R. *Improvements in apparatus for pouring iron or other metal into moulds.* Dated August 19, 1856. (No. 1937.)

An illustrated description of this invention forms the first article of this number.

BESSEMER, H. *Improvements in the manufacture of iron and steel.* Dated Aug. 19, 1856. (No. 1938.)

This invention was described at p. 221 of No. 1752.

BROUARD, J., and J. HUBERT. *Certain improvements in reefing the sails of ships or vessels.* Dated August 19, 1856. (No. 1939.)

The use of reef points, tablings, and bolt ropes are dispensed with, and the cutting or slotting of the sails in the middle is rendered unnecessary. The improvements consist—1. In constructing a boom iron with an additional hoop in which the lower yard (upon which the sail is reefed) rotates. 2. Of a new form of hoop furnished with a hook for sustaining and strengthening the lower rotating yard in the middle. 3. In the arrangement of pulley blocks and tackle for reefing the said sails.

NEWTON, W. E. *An improvement in valves for steam engines.* (A communication.) Dated Aug. 19, 1856. (No. 1941.)

This consists in the union of a balance valve with the ordinary slide valve of a steam engine, the latter being operated in the ordinary way, while the operation of the balance valve may be regulated by the governor or by the engineer, so that the amount of steam employed may at all times meet the requirements of the engine.

DOGGENFELD, A. C. V. de. *Improved glass ornaments for ornamenting gardens, summer-houses, dinner and other tables, and for other ornamental or decorative purposes.* Dated Aug. 19, 1856. (No. 1942.)

This consists in the application of masses or forms of coloured glass for the ornamenting flower-beds, summer-houses, conservatories, arbours, &c. Hollow bulbs of glass, of suitable colour and shape, are chiefly used.

JOHNSON, J. H. *Improvements in steam engines.* (A communication.) Dated Aug. 20, 1856. (No. 1943.)

This invention relates to several constructions and arrangements of steam engines applicable as stationary, marine, and locomotive engines, for obtaining greater effect, compactness, and solidity.

JOHNSON, J. H. *Improvements in roller fulling-mills.* (A communication.) Dated Aug. 20, 1856. (No. 1944.)

The ordinary endless band of cloth is subjected to pressure alternately in a horizontal and vertical direction; for this purpose four pairs of fulling or pressing rollers are used, the first pair being arranged in a vertical position, and the succeeding pairs are arranged horizontally and vertically alternately. A gradually diminishing velocity is imparted to the succeeding pairs of fulling rollers, by which means the cloth which is carried loosely is pushed lengthwise between the pairs of rollers at the same time that it is subjected to pressure.

CLARK, C. *Improvements in combining and arranging looking-glasses for toilet purposes.* Dated Aug. 20, 1856. (No. 1946.)

Two or more glasses are placed in the same frame, but at an angle to each other.

LALEMAN, J. *Improved machinery for combing flax and other similar fibrous materials.* (A communication.) Dated Aug. 20, 1856. (No. 1948.)

The flax holders which hold the stricks of flax while operated upon by the comb teeth of the working cylinders are connected to an endless chain, band, or strap, passed in a serpentine direction round a series of pulleys or drums, to which motion is communicated from the driving shaft by suitable gearing.

MAUDSLAY, J. *Improvements in steam engines, especially applicable to screw propulsion.* Dated Aug. 20, 1856. (No. 1950.)

This invention was described and illustrated at page 193, No. 1751, and page 217, No. 1752.

HACKING, J., and W. WHEELER. *Improvements in the mode or method of winding, warping, sizing, and beaming cotton, woollen, linen, or other yarns or threads, and in the machinery or apparatus employed therein.* Dated Aug. 21, 1856. (No. 1951.)

Instead of the usual plans of winding the yarn or thread from cops on to bobbins or spools, then placing these creels, and winding it from them on to beams or rollers, and then passing it again through the sizing or dressing machine, the patentees accomplish all the said processes at one operation by one continuous apparatus, or they use their apparatus for winding and warping alone, using the sizing process separately as usual, if found desirable.

CROSSLEY, J., and J. BOLTON. *Improvements in apparatus or means employed in the printing of yarns for carpets and other fabrics.* Dated Aug. 21, 1856. (No. 1952.)

The oiled or other cloths used for placing the yarns to be printed upon are coated with oil paint, previous to their being used for that purpose, by which a better surface is given thereto. Cloth prepared by a coating of India rubber or gutta percha is also used for the purpose. The use of the shellings or chopped straw used in the steaming process is also dispensed with partially, by supporting the yarns during that process upon openwork of cards, metallic or fibrous, forming a sort of cradle, upon which are placed a sufficient quantity of oat shellings to prevent the colours from staining the wood, and communicating these stains to the yarns placed on them. By the use of

suitable receivers between the different layers of yarns to collect any droppings therefrom, the necessity for the use of cocoa nut fibre on the top of each layer is avoided.

AKROYD, W., and J. THOMPSON. *The manufacture of carpets or other fabrics.* Dated Aug. 21, 1856. (No. 1953.)

This consists in producing a flat surface carpet or other fabric having no pile, terry, or raised surface, using cotton and worsted for the warp, and one or more shuttles with the weft. A portion of the cotton warp used on one side, and a portion of the worsted warp used on the other side of fabric crosses the weft in certain proportions, and in such manner as not to form figure or ground on the contrary side of the fabric.

YORK, T. *A new or improved safety valve and low water indicator for steam boilers.* Dated Aug. 21, 1856. (No. 1955.)

This invention was described and illustrated at page 344 of our last Number.

KENTON, R. *A new or improved manufacture of fishing reels.* Dated Aug. 21, 1856. (No. 1956.)

Fishing reels are made of papier maché.

FARMER, G. J. *Improvements in machinery to be used in the manufacture of chain links, buckles, buckle slides, rings and other similar articles.* Dated Aug. 21, 1856. (No. 1958.)

This machinery cannot be described without engravings.

CHIPP, T. J., and R. BITMEAD. *Improved apparatus for drilling and boring.* Dated Aug. 22, 1856. (No. 1959.)

The patentee describes an apparatus designed as a substitute for the clamp and weighted beam or lever usually employed to support the upper end or centre of the brace or boring bar in drilling or boring by hand, but it requires engravings to illustrate it clearly.

NEWTON, W. E. *Improved machinery for cutting chenille.* (A communication.) Dated Aug. 22, 1856. (No. 1962.)

The fabric is first woven, and then cut up into strips by a machine, which consists of a circular shaft carrying a series of circular cutters made to rotate with considerable velocity.

GATTY, F. A. *Certain improvements in dyeing.* Dated Aug. 23, 1856. (No. 1964.)

Chloride of sodium (or common salt) is used in dyeing, with garancine, alizarine, and other preparations of madder.

HALLEN, E. *Improved means for washing wool.* Dated Aug. 23, 1856. (No. 1966.)

This invention consists of a frame (inside which the wool is put) filled in with wire or other open material to allow the water to enter and pass out, as through a sieve, during the operation of washing, or to drain off the water.

JOHNSON, J. H. *Improvements in stocking looms.* (A communication.) Dated Aug. 23, 1856. (No. 1967.)

Stocking frames are so arranged that the necessary diminutions or narrowings at the calf, the heel, and the end of the feet, can be performed on it without taking the stocking to other frames after the leg has been completed in the first. The mechanism for driving the loom is also modified.

RACSTER, W. *Improvements in apparatus for regulating the supply of gas.* Dated Aug. 23, 1856. (No. 1969.)

This apparatus consists of certain floats, valves, &c., arranged in a manner that cannot very well be described without engravings.

STERLINGUE, E. *Improvements in preparing for tanning, and in tanning hides and skins.* Dated Aug. 23, 1856. (No. 1970.)

In this process the skins and hides, after the flesh and hair have been stripped off, and without any further preliminary treatment, are placed in direct contact with the ground bark, tannin or tan, and the ooze, tan liquors, or tannic acid solutions, the process of raising or swelling with acids being wholly dispensed with. The invention also comprises certain improved tan pits, methods of loosening the hair on skins, tanning, &c.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

SKINNER, C. R. *Certain improvements in tanning and finishing off leather.* Dated Aug. 15, 1856. (No. 1911.)

A wheel works in journals at the side of the tan pit, allowing about one-third of the periphery to be submerged; and to suitable rails which form the periphery of the wheel, parallel to its axis, the skins to be tanned are fastened. The wheel is then set in motion, and revolves slowly until the skins are thoroughly tanned. For finishing off leather, a roller is secured to the end of a strong arm having a kind of pendulum action, underneath which is placed a bed, circular from end to end, and by moving and stretching the hide on the bed, the roller being pushed backwards and forwards, great uniformity of thickness is given to the skin.

DUBS, H., and J. EVANS. *Improvements in effecting the consumption of smoke.* Dated Aug. 15, 1856. (No. 1912.)

The furnace or fire-box is partially divided by a transverse mid-feather, extending downwards a short distance from the roof. Below this is the grate, inclined downwards from the front to the back, and capable of being raised or lowered by segmental racks and levers. The coal gradu-

ally works down to the lower end of the grate. The coals are thrown on to the front part of the grate, and the smoke, &c., pass through the incandescent fuel and through openings in the mid feather.

SLATER, G., J. WILLIAMS, and S. WHITAKER. *Certain improvements in power-looms for weaving.* Dated Aug. 16, 1856. (No. 1915.)

This consists of a novel formation of the crank rods or arms used as a connecting medium between the lathe or slay and the main or crank shaft, and also of an arrangement of mechanism for actuating these crank arms or rods at the time required, the object being to prevent concussion or the sudden stoppage of the loom.

HODGKINSON, A. *Improvements in bleaching, scouring, and cleansing plain and embroidered fabrics.* Dated Aug. 16, 1856. (No. 1918.)

The inventor steeps the fabric for 10 or 12 hours in a solution of caustic soda, and black soap. He then passes it through a similar solution at boiling heat, and immediately through mangles, squeezers, or squeezing rollers. In addition to which he uses circular or flat brushes, that operate upon the goods while passing through the rollers. He repeats the operation of passing the goods through the solution and squeezing rollers until the embroidered work is thoroughly cleansed, and afterwards bleaches out the goods by the usual way.

RICHARDSON, T. C. *The process for the procuring and manufacturing the sulpho-saccharate of simarubine.* Dated Aug. 18, 1856. (No. 1922.)

Take the wood of the simaruba-tree with acid sulphuricum dilution until the wood is exhausted, then filter and neutralise with any earthy carbonates, so that any excess of acid is neutralised. Evaporate, treat with animal carbon, alcohol, and crystallise.

CAMBRIDGE, W. C. *Improvements in the construction of portable railways.* Dated Aug. 18, 1856. (No. 1926.)

This consists in adapting to the running wheels of portable engines, agricultural implements, wagons, carts, &c., a flexible metallic road or railway, composed of parts, and adapted to be laid down on the ground, so as to allow the wheels to pass over the same.

SUTTON, E. *An improved construction of stereoscope.* Dated Aug. 19, 1856. (No. 1935.)

1. The various parts of the stereoscope are so combined that it may be easily compressed into a small case. 2. It is made to possess all the advantages of the most improved rigid stereoscope by the application of certain hinges and springs.

APPERLY, J. *Improved machinery for carding wool or other similar fibrous substances.* Dated Aug. 19, 1856. (No. 1940.)

The scribbling and carding machines or condensers are connected in one continuous series, so that when the wool is weighed into the first scribbling machine, it will pass throughout the whole series of machines, and be delivered at the end in the proper state to be operated upon by the subsequent machinery.

SAGAR, T., and C. TURNER. *Certain improvements in power looms for weaving.* Dated Aug. 20, 1856. (No. 1945.)

These relate—1. To a method of governing the "swell" of the shuttle box, and consists in the application of a spiral or other spring in a nearly direct or positive line to the "back finger" of such "swell." 2. To an improved form of the slay sword levers of the anti-positive motion, being improvements upon the invention patented by the above C. Turner, 12th Jan., 1855, consisting in bevelling or rounding the surfaces acting against each other, instead of forming them square. 3. To the before-mentioned levers, and consist in fixing the stop-rod bearings in the levers at a point below their fulcra. 4. To a method of disengaging the driving strap, or transferring it from the fast to the loose pulley, by placing the ordinary frog upon a bar of metal extending from end to end of the loom, and fitting loosely upon the framing, so that when the frog is struck by the stop rod the bar is forced back against a vertical rod placed behind it, which then strikes the weft fork lever, and the strap is thus disengaged.

GOSSAGE, W. *Improvements in obtaining sulphur and metals from certain ores and other compounds of metals.* Dated Aug. 20, 1856. (No. 1947.)

In operating upon the sulphurets of metals, either in ores or otherwise, the inventor applies atmospheric air for extracting sulphur and metal therefrom, whilst the compound is in a state of fluidity caused by heat, and so that the air is caused to bubble through the fluid, evolving much heat, and producing sulphurous acid, which, passing off in a gaseous state, leaves the metal deprived of much sulphur, and suitable for use, either directly or after subsequent purification.

STONES, W. *Improved machinery for damping sheets of paper intended to be printed upon, so as to render the usual operation of wetting unnecessary.* Dated Aug. 20, 1856. (No. 1949.)

The inventor proposes to cause jets of steam or a fine spray of water to be thrown on one or both surfaces of the paper, as it is passed through the machine.

HEAP, W., D. SHARP, and G. KNOWLES. *Improvements in the construction of furnaces*

for economizing fuel and preventing smoke. Dated Aug. 21, 1856. (No. 1954.)

This consists in employing two separate fires. Two dampers are used for shutting off the communication, if necessary. By opening one, the draught and smoke are made to pass from one furnace fire over the other.

NEWTON, W. E. *Improvements in pumps for raising water.* (A communication.) Dated Aug. 21, 1856. (No. 1957.)

The improved pump, which is double acting, having duplicate parts, consists principally of two moveable cylinders connected together by a vibrating beam.

PATTEN, W. *An improvement in apparatus for supplying water to the basins of water closets and other vessels.* Dated Aug. 22, 1856. (No. 1960.)

The supply-pipe has applied to it a chamber or valve box, divided by a partition, in which is a passage covered by a valve, the stem of which passes through a stuffing-box. The other part of this chamber or valve box is connected with the basin of a water-closet or other vessel.

GARDISSAL, C. D. *A new or improved rotary engine.* (A communication.) Dated Aug. 22, 1856. (No. 1961.)

In this engine the abutment against which the steam acts slides in and out of the steam chambers towards and from the centre axis and main shaft, to which eccentrics or cams are fixed, so as to withdraw the sliding abutments at the proper times, to allow the pistons to pass those points, and again to force them back before the admission of the steam. The steam ports are close to the abutments.

JAY, S., and G. SMITH. *Improvements in ornamenting or trimming articles of outer attire, such as dresses, mantles, bonnets, and the like.* Dated Aug. 22, 1856. (No. 1963.)

This consists in ornamenting or trimming articles with enamelled or coloured leather, (or imitation leather.)

BENOIST, P. *An improvement in the construction of stereoscopes.* Dated Aug. 23, 1856. (No. 1965.)

The effects of the fenakisticope and the stereoscope, the former giving movement to the figures but no relief, the latter relief but no movement, are produced by one instrument.

JOHNSON, J. H. *Improvements in casting metals.* (A communication.) Dated Aug. 23, 1856. (No. 1968.)

Centrifugal force is used in casting steel articles, such as railway wheels, tubes, and hollow axles, by causing the chills to rotate at a high velocity during the time the molten metal is running in.

MOSES, A. *Improved machinery for propelling vessels on water.* Dated Aug. 23, 1856. (No. 1971.)

On the propeller shaft a pinion is keyed, and into this pinion gears a spur driven by a ring of teeth of large diameter, attached to a circular platform mounted on an inclined shaft. Upon this platform foothold is made for horses which, on the principle of the tread-wheel, cause the rotation of the ring of teeth, and thus transmit motion through the gearing to the propeller shaft; or steam may be used to drive the ring of teeth.

STOCKS, S. *Improvements in reaping-machines.* Dated Aug. 23, 1856. (No. 1974.)

Circular cutters, similar to circular saws, and rotating on their axes in the same manner, are employed, and disposed across the breadth of the machine, and overlap each other, so as to cut the whole breadth at one time. They are driven at a quick speed by a strap or band. The crop falls against an inclined platform, through which teeth or tines are alternately projected and withdrawn; they carry the corn towards one side of the machine, where it is delivered.

DICKIE, H. *Improvements in machinery or apparatus for cutting or shaping wood or other substances.* Dated Aug. 25, 1856. (No. 1975.)

This relates particularly to the manufacture of the wooden handles of shovels, hammers, &c. The shaping is effected by means of a wheel or rotary disc carrying knives or cutters, and set upon a horizontal spindle revolving at a high velocity.

PROVISIONAL PROTECTIONS.

Dated March 9, 1857.

676. James Denby Lee, of Shipley, and James Crabtree, of Windhill, both in the county of York, machine makers. Improvements in power looms.

678. William Tytherleigh, of Birmingham, manufacturer. Improvements in the manufacture of bullets and shot.

682. Edward Cook, of Birmingham, gentleman, and James Stokes, journeyman metallic bedstead maker, also of Birmingham. Improvements in certain parts of metallic bedsteads.

684. Frederick Simpson, of Redhill, Reigate. An improved mode of forming a screw in the necks of bottles, jars, and other similar vessels.

686. Carl Heinrich Julius Wilhem Maximilian Liebmann, of Fartown, Huddersfield, warehouseman. Improvements in the purification of water and the preparation of materials requisite for the process. A communication.

688. William Edward Newton, of Chancery-lane, civil engineer. Certain improvements in steering apparatus for ships and other vessels. A communication.

690. James Garth Marshall, of Leeds, flax spinner. Improvements in machinery for preparing flax, hemp, China grass, and other fibrous substances.

692. William Henry Barlow, of Derby, and James Samuel, of Great George-street, Westmin-

ster. Improvements in cast iron sleepers for railways.

694. Frederick Alexander Fitton, of Ardwick, Manchester, mechanic. Improvements in certain machines for preparing, spinning, and doubling cotton and other fibrous substances.

Dated March 10, 1857.

698. William Charles Day, of the Strand, military equipage manufacturer. Improvements in portmanteaus.

700. James Hamilton, of Rochdale, tin plate worker. Improvements in coating iron and other metals with metallic substances.

Dated March 11, 1857.

702. Robert Lewis Jones, of Chester. Improvements in regulating clocks by electricity.

704. William Makin, of Hollingworth, Chester, engineer. Improvements in furnaces and apparatus for generating steam.

706. Simeon Denham, of Stafford-square, Wakefield. A self-acting machine for the delivery of postage and receipt stamps.

708. John Robert Reid Humfrys, of Salford, Lancaster, master of arts. Improvements in apparatus for burning gas.

710. James Davis Cooper, of Great James-street, Bedford-row. Improvements in producing engraved surfaces for surface printing.

Dated March 12, 1857.

712. Albert Viscount de Waresquiel, gentleman, and Julien D'Helle, civil engineer, both of Paris. Improvements in railway carriages.

714. John Avery, of Essex-street, Strand. An improved method of preserving butter. A communication from J. Girard, of Mi Commet, France.

716. John Shaw and William Manwaring, both of Banbury, Oxford. Improvements in machinery or apparatus for cutting or reducing turnips or other vegetable substances.

718. William Edward Newton, of Chancery-lane, civil engineer. Improvements in the process of, and apparatus for tanning. A communication from C. C. Knoderer, of Strasbourg, France.

Dated March 13, 1857.

720. Emmanuel Berger, upholsterer, and Jules Edouard Matile, merchant, both of Paris. Improvements in machinery for beating and brushing carpets.

722. William Ramsey Nevins and Joseph John Yates, both of New York, United States, machinists. Improvements in preparing and baking bread and biscuits, and in machinery employed therein.

724. William Hesketh, of Accrington, Lancaster, manufacturer. Improvements in looms.

Dated March 14, 1857.

726. Charles Cowper, of Southampton-buildings, Chancery-lane. Improvements in the manufacture of artificial leather, or a substitute for leather. A communication from A. Micoud, of Paris.

728. Robert Macdonald, of Glasgow, manufacturer. Improvements in sewing or embroidering textile fabrics. Partly a communication.

730. Joseph Pimlott Oates, of Erdington, Warwick, surgeon. Improvements in machinery for the manufacture of bricks, tiles, pipes, and other articles made of plastic materials.

732. Henry Bradley, of Hull, merchant, and Elmit Wray, of the same place, machine maker. Improvements in beaters used in thrashing machines.

Dated March 16, 1857.

734. George Marshall, of Morpeth, Northumberland, joiner. An improved saw setting apparatus.

736. James Thomson, of Black-Ruthven, Perth, N.B., farm steward. Improvements in mowing and reaping machines. A communication from W. Thomson, of Canton, United States.

738. Henry Martin, of Hanwell, Middlesex, engineer. Improvements in apparatus for the supply of water to steam boilers.

740. Jules Moes, of Rue de l'Echiquier, Paris. Improvements in warming and ventilating.

742. Richard Archibald Brooman, of 166, Fleet-street, London, E.C., patent agent. Improvements in apparatuses for splitting leather, in order to manufacture tubes, sheaths, and other articles. A communication.

Dated March 26, 1857.

843. Uriah Lane, of Regency-square, Brighton. An improvement in the transmission of motive power.

845. William Thomas Clark, of Cottage-place, City-road. A portable metallic spring mattress.

847. Dominico Tomasini, of Great Coram-street, upholsterer. Improvements in the construction of easy chairs and chamber commodes.

849. Augustus Frederick Butler, of Ceylon. Improvements in machinery for pulping coffee.

851. Jason J. Palmer, of New York, United States. Improvements in the construction of steam boilers.

853. George White, of Port Glasgow, Renfrew, B.N., manufacturer. Improvements in weaving.

Dated March 27, 1857.

855. Emil Von Löwenstein, of New-street, Bishopgate-street, London, inspector of mines. Improvements in the construction of ovens for the manufacture of coke.

859. George Sugden and Jonas Briggs, of Bradford, York, spinners and manufacturers. Improved machinery for weaving checks or figured fabrics.

861. Charles Martin, of Castle-street, Reading, civil engineer. Improvements in working signal apparatus on railways.

863. William Ross, of Glasgow, plumber. Improvements in apparatus for regulating the passage of fluids.

Dated March 28, 1857.

867. Edward Blackett Beaumont, of Woodhall, Barnsley, York. Improvements in lamps and apparatus used in coal mines.

869. Hippolyte Benigne Girard, of Paris, chemist. Improvements in insulating telegraphic wires or conductors, and in apparatus for stretching such wires.

871. John James Russell, of Wednesbury, Stafford, metal tube manufacturer. Improvements in the manufacture of metal tubes.

Dated March 30, 1857.

873. Arthur Neild and Nathaniel Buckley Sutcliffe, both of Ashton-under-Lyne, Lancaster, cotton spinners. Improvements in treating or cleansing certain descriptions of cotton waste.

875. David Jack, of Glasgow, mechanic. Improvements in washing or cleansing textile fabrics and materials.

877. William Childs, jun., of Brighton, manufacturer. Improvements in the construction of expansible boxes, cases, and receptacles.

879. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in warming and ventilating apartments. A communication from D. Leasure.

881. Arthur Granger, of High Holborn, stationer. An improved manufacture of safety envelope.

Dated March 31, 1857.

885. John Campbell Evans, of South Lambeth, engineer. Improvements in railway rolling stock.

887. Samuel Jabez Goode, of Aston, near Birmingham, machinist. An improvement or improvements in depositing metallic alloys by electricity.

889. George Lauder, of Dunfermline, Fife, N.B., merchant, and Thomas Ireland, of the same place, merchant. Improvements in the manufacture of brine to be used in the manufacture of salt.

891. John Graham, of Ann-street, Devonport-street, Commercial-road East, pattern maker. An improved steering apparatus.

893. Anguish Honour Augustus Durant, of the Conservative Club, St. James's, esquire. Certain improvements in omnibuses.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

898. Richard Egan Lee, of Giltspur-street, London, printer. A portable printing apparatus, adapted alike for moveable type, lithography, and copper plate. Dated 1st April, 1857.

962. Gilbert Burrington, of Chudleigh, Devon, gentleman. Making the stop funnel for the prevention of waste of liquids whilst bottling or transferring them from one vessel to another. Dated 6th April, 1857.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," April 14th, 1857.)

2869. J. Denis. Improvements in apparatus for corking and uncorking bottles without leaving any air between the liquid and the cork. A communication.

2892. H. Ogden and H. Hibbert. Improvements applicable to colliery and locomotive engines, for the purpose of arresting or retarding their motion at required intervals, and of indicating the amount of work done in relation to such intervals.

2901. S. R. Smith. Improvements in anchors.

2902. J. Leslie. An improvement in stoves and fire places.

2910. R. F. Miller. A mode of printing tables of fares, advertisements, notices, tablets, ornamental designs, figures, and other like announcements, on painted or other surfaces, to supersede writing.

2912. J. Harris. A pneumatic signal apparatus, and mode of working the same.

2920. J. Walton. Improvements in tables.

2926. W. Storey and T. Storey. Improvements in forming ornamental devices on the surface of paper and certain prepared woven fabrics.

2936. T. Wheatley and W. Wheatley. Improvements in fog-signals, and in the means of working the same.

2938. V. Delperdange. Improvements in metallic and elastic packing.

2944. W. P. Miles. Improvements in locks and fastenings. A communication.

2950. J. T. Wright and E. P. Wright. A new or improved manufacture of ropes, cords, lines, twines and mill bandings.

2952. E. Paton and C. F. Walsh. Improvements in apparatus for charging and capping the nipples of fire-arms.

2965. J. Metcalf. Improvements in the manufacture of alum or sulphate of alumina.

2995. F. B. Howell. Improvements in machinery for cutting or making corks. A communication.

3010. J. Penny and J. Booth. Improved machinery for washing, cleansing, and drying grain.

3018. T. Newbury. Improved machinery for making screws.

3075. R. R. Cox. Improvements in the manufacture of artificial fuel, and in machinery for that purpose.

3078. T. Shaw. Improvements in furnaces or fire-places.

519. A. Quidde and C. Mayet. Certain improvements in propelling.

552. W. E. Newton. Improved machinery for making preparings from waste silk, cotton, wool, flax, hemp, and other fibrous materials. A communication.

667. C. Lungley. An improved mode of constructing dry docks and basins for the stowage of ships.

674. G. Philcox. Improvements in marine and pocket chronometers and other time keepers.

676. J. D. Lee and J. Crabtree. Improvements in power looms.

690. J. G. Marshall. Improvements in machinery for preparing flax, hemp, China grass, and other fibrous substances.

716. J. Shaw and W. Manwaring. Improvements in machinery or apparatus for cutting or reducing turnips or other vegetable substances.

717. W. E. Newton. Improved machinery for drawing and preparing silk, cotton, wool, flax, hemp, and other fibrous substances. A communication.

728. R. Macdonald. Improvements in sewing or embroidering textile fabrics. Partly a communication.

736. J. Thomson. Improvements in mowing and reaping machines. A communication.

853. G. White. Improvements in weaving.

863. W. Ross. Improvements in apparatus for regulating the passage of fluids.

875. D. Jack. Improvements in washing or cleansing textile fabrics and materials.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

814. John Rankin.
817. John Robert Johnson.
843. Zachariah Round.
845. Edward Lavender.
850. Thomas Schofield Whitworth.
859. William Coltman.
861. Samuel Colt.
923. Aimé Blavier.

LIST OF SEALED PATENTS.

Sealed April 14, 1857.

2400. Richard Sumner.
2401. John Knowles, jun.
2406. George Guillaume.
2407. Joseph Henry George Wells.
2408. Edward Hallen.
2409. James Burrows.
2410. Bennett Johns Heywood.
2415. Alfred Tooth.
2418. Charles Napoleon Wilcox.
2458. Josiah George Jennings.
2460. Anthony Lorimier.

2466. John Cowdery Martin.
2508. William Benson.
2519. Thomas Allan.
2527. William Septimus Losh.
2528. Jean Louis Marie.
2533. Adolphe Aubril.
2541. Thomas Smith Henzell.
2546. Frederic Whitaker.
2569. James Coul Sinclair.
2587. William Gray and John Tate.
2844. John Carter Ramsden.
2916. Thomas Peake.
3002. Charles Fay.
3020. Theodore Dethier.
271. James Thom.
328. John Henry Johnson.
416. William Edward Newton.
420. Thomas Wingate.
481. Charles Wye Williams.
435. James Cocker.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Percontator.—Have you forgotten the use of the fusee?

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

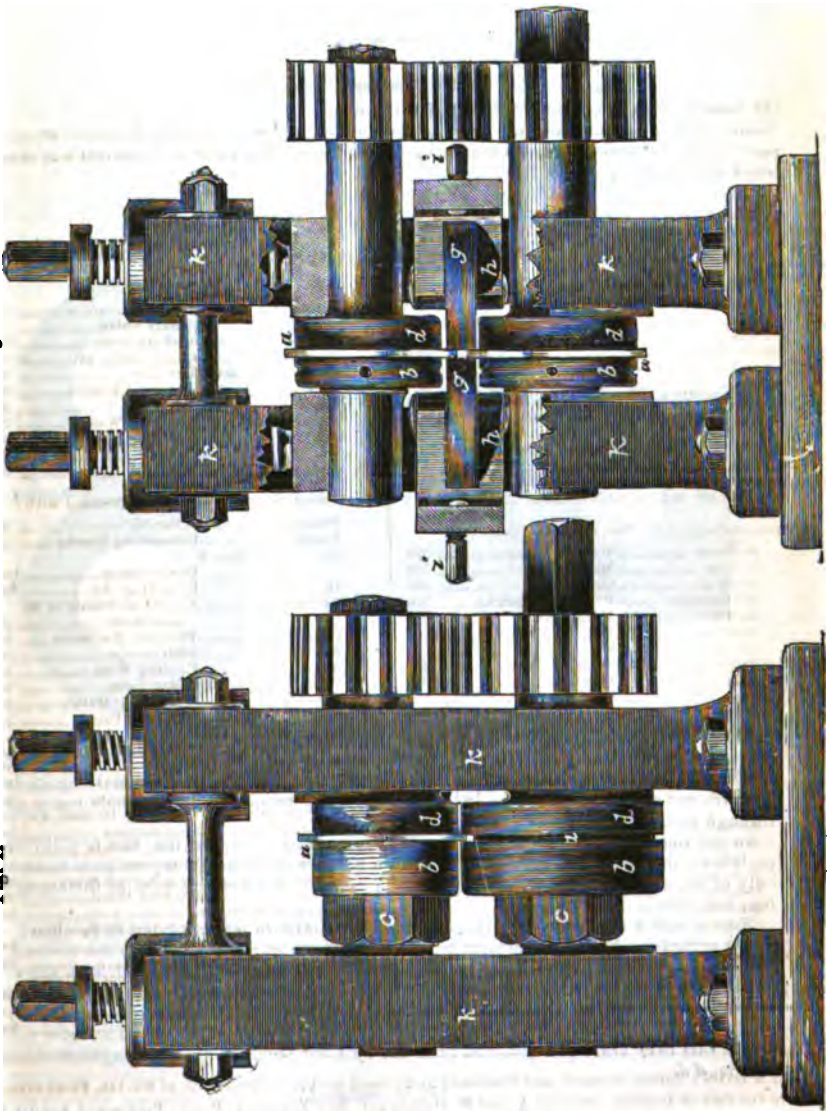
No. 1759.] SATURDAY, APRIL 25, 1857. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

WHITTLE'S IMPROVED MACHINERY FOR MAKING NAILS.

Fig. 3.

Fig. 1.

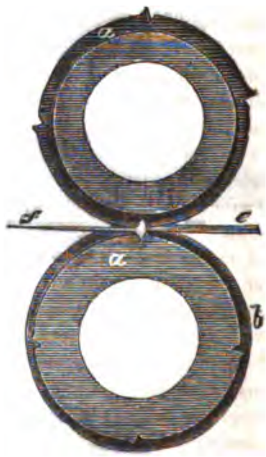


WHITTLE'S IMPROVED MACHINERY FOR MAKING NAILS.

Mr. W. Whittle, of Smethwick, Stafford, has patented a set of machines for making nails, which machines are represented in the annexed engravings. The first is for manufacturing clasp nails, or for forming blanks of nails to be afterwards headed by other machines. Fig. 1 represents a front elevation of a pair of rolls for this purpose, and fig. 2, a side elevation of them, showing the formation of a clasp nail; and figs. 3 and 4 are modifications of the same. *a a* are circular discs of steel fashioned on their peripheries into the form required for forming nails or blanks, which discs are perforated through the centre for the purpose of slipping them on to the spindle of the rolls. *b b* are loose collars, which are also perforated to fit the roll spindles; *d d* are collars firmly attached to the spindles, a portion of which spindles are screw-cut to receive the nuts, *c c*, which force the loose collars, *b b*, together with the discs, *a a*, against the fixed collars, *d d*, and hold them securely in their places. It will be seen that the upper collars are smaller in diameter than the lower ones, thus causing the disc of the upper roll to project, while the lower collars, being larger than the disc, form a groove between the said collars to receive the nail rod, and prevent the said rod from being spread out side ways whilst being rolled. The action of the rolls is as follows:—A strip of heated metal or nail rod, *e* (fig. 2), is

Fig. 4.

Fig. 2.



inserted between the two circular discs or dies, *a a*, and motion being given to the rods, the rod, *e*, is drawn forward and formed into a nail, *f*; the portion of the dies at the back of the head coming in close contact cut the nail from the rod, which rod is again drawn forwards and another nail formed, and cut off in a like manner, until the whole rod is passed through and formed into separate nails.

In forming blanks which are to be afterwards headed, one of the dies is plain on its periphery, the other disc being cut in such a manner as to give a taper figure to one side only of the shank of the nail. The blanks in this case are not separated in the act of rolling, but remain connected.

Figs. 3 and 4 represent an arrangement of four rolls for effecting the same object. In this modification both discs project beyond the collars between which they are secured, and the rods for forming the nails are retained in their position, and prevented from spreading by the side rolls, *g g*, which side rolls are held in their place by the carriages, *h h*, which are fitted in between the housings of the rolls, *k k*, and pressed to the discs or dies by the set screws, *i i*. A plan of the carriages and side rolls is seen at fig. 4. The loose collars, *b b*, in this case are screw-cut, and form the nuts for securing the discs against the fixed collars, *d d*.

(*To be continued.*)

SUBMARINE TELEGRAPHS.

The *Times* of the 22nd contains an able article on the Great Atlantic Submarine Telegraph Cable. After describing the mode of manufacturing the cable, at the works of Messrs. Glass and Elliot, near Greenwich, and of Messrs. Newall, Birkenhead, and also the method of laying it from the *Agamemnon* and *Niagara*, the writer proceeds to point out the false principles upon which the Atlantic cable is constructed as follows:—"In the first place," he says, "there is no wire for the return current, and the conducting wire itself is ridiculously small ($\frac{1}{16}$th of an inch in diameter), when it is considered that it is intended to carry a current for nearly 3,000 miles. The latter is a most serious fault; so also is covering the outside with so fine a description of wires that three months' rust will entirely destroy them. But the greatest fault of all is that, in our judgment, the whole cable is constructed on a wrong principle. In a previous article on the subject of submarine telegraphic communication we pointed out the errors which have already led to the destruction of so many cables, and the simple manner in which they are remedied by Mr. Allan's patents. ...... Why are not these patents adopted, which, by the use of a large conductor, make the core of the cable its strength, and do away altogether with the necessity for outside spiral wires? By these patents cheapness, lightness, increased conductibility, and therefore certainty of electric action, are insured. Only by the adoption of plans like these can the public ever hope for any extensive and useful scheme of submarine communication. If this Atlantic cable fails, what will be the result? Why, that another, or a somewhat similar one, will be ordered immediately. Is it likely, then, that manufacturers will ever press upon the notice of companies a very cheap cable certain to do its work, when under the present system they make two or three very expensive ones, often (as in the Mediterranean) with no other result than that of benefiting trade while making it, and depositing it when made at the bottom of the ocean? Shareholders must look into these matters for themselves. We can only point the way, and it rests with them to follow it. In conclusion, we may mention that it is intended to work the cable with Smee's batteries—a most costly and troublesome plan. Morse's recording telegraph, once a very valuable instrument, though now behind many recent inventions, is to be used."

At a recent meeting of the Royal Institution of Great Britain, Mr. J. Watkins Brett, M.R.I., gave a brief sketch of the part he has taken in the promotion of submarine telegraphs, and of some of the difficulties encountered by him at different stages of his progress. The following is a condensed statement of his remarks, and the grievous failures detailed by Mr. Brett will do more than any remarks of ours to support the trenchant criticism of the *Times*, quoted above:

It has been stated, said Mr. Brett, that I had sought to appropriate to myself the honour of the invention of the submarine telegraph. My first idea of submarine telegraphs arose out of a conversation with my brother early in 1845, when discussing the electric telegraphs between London and Slough; and, in considering the practicability of an entire underground communication, the question arose between us, "If possible under ground, why not under water?" and "If under water, why not along the bed of the ocean?"

The possibility of a submarine telegraph then seized upon my mind with a positive conviction; and I was ignorant until three or four years since that a line across the Channel had been previously projected by Professor Wheatstone, and also of the experiments by frictional electricity during the last century, to send a current across rivers.

In June, 1845, my brother and I entered, in our joint names, at the Government Registration Office, a project for uniting America with Europe, by the very route now adopted; and in July of the same year submitted to the Government a proposition for uniting our colonies with Great Britain. This offer not being accepted, I turned my attention to the Continent. In 1847 I succeeded in obtaining permission from Louis Philippe to unite England with France by a submarine line, but failed to obtain the attention of the public, it being considered too hazardous for their support.

The first attempt to connect England and France by a submarine telegraph was made in 1850, with a copper wire inclosed in gutta percha, a material which opportunely came to our aid about that time. The trial was, however, successful; and the *Times* of the day justly remarked, "the jest of yesterday

has become the fact of to-day."! Knowing, however, the incredulity expressed as to the success of the enterprise, I sent a trustworthy person to Cape Grinez, to procure the attestation of all who had witnessed the receipt of the messages there; and the document was signed by some ten persons, including an engineer of the French Government, who was present to watch the proceedings; this was forwarded to the Emperor of the French, and a year of grace for another trial was granted.

A more permanent cable was submerged in Sept., 1851, between the South Foreland and Sangate on the French coast; and the line of telegraphic communication between England and France was established.

In May, 1853, the Dover and Ostend line was laid down.

My next trial was in the unknown depths of the Mediterranean. The same year concessions were granted to me by the French and Sardinian Governments, to unite the islands of Corsica, Sardinia, and the colony of Algeria with their respective capitals. The cable for this purpose was laid in coils in the hold of the vessel employed, and before paying out was passed four or five times round two large iron drums, running out over an iron saddle on the stern of the vessel to the water, the pressure at this point in deep water being very great. For fourteen miles all went on steadily: the pressure now caused some of the wires of the outer covering to break from tension, and on entering the great depths a sudden flight of the cable occurred. Every means were employed to stop it, and after a few minutes its progress was arrested, and it was brought up by a dead stop, when it was found that the insulation was destroyed in a portion that had passed into the sea during this violent flight. Our only chance now was to recover from the sea the injured portion, cut it out, and make a fresh join—a difficult and tedious operation, which occupied upwards of thirty hours. When the injured portion came up, it was found that the violent twist of the outer wire had cut into the gutta percha wire of the inner core, and exposed it to the fatal action of the water, which carried off the current. Having repaired the injury, an electric current was sent to Spezzia; and the soundness of the six conducting wires to land proving correct, we proceeded. On nearing Corsica the vessel anchored about a mile from the coast, and the remaining portion of the cable was conveyed ashore in boats. This done, an electric communication was instantly dispatched through the cable to Paris and Turin, announcing to the French and Sardinian Governments the telegraphic union of Corsica with France and Piedmont. We then sailed for the Straits of Bonifaccio, and the submerging of the submarine cable between Corsica and Sardinia was successfully accomplished a few days afterwards; also the completion of the land lines, in the aggregate about 560 miles in length, through the two islands, uniting the different towns.

The submarine cable for connecting Sardinia with Algeria was made the same year. In consequence of the impossibility of obtaining a vessel of the required size from the English or French Governments, I engaged the *Result*, a large sailing vessel, and two steamers to tow her, and operations were commenced from Cagliari, in September, 1855. We encountered, on entering the great depths, one of those alarming flights of the cable which occurred in the previous year. In this instance about two miles, weighing sixteen tons, flew out with the greatest violence in four or five minutes. There was no alternative but to sever the injured portion in the sea.

I had another and longer cable manufactured for the ensuing year, and it was resolved to carry it east of Galita, making a detour round the island, and thence to La Calle on the African coast. This attempt was also a failure, from the same cause.

The great depths of the Atlantic have, until within these very few years, remained unknown. At last it was proved that, by a common twine thread for a sounding line, and a cannon-ball of 60 lbs. weight for a sinker attached, the line being allowed to run from the reel as fast as the ball would take it (care being had to pay it out from a boat which could be kept stationary, to maintain the line as perpendicular as possible), correct soundings could be obtained. The greatest depths which have been reached by these means in the North Atlantic Ocean have been 25,000 feet.

It was some two years since, when Mr. Faraday was explaining the subject of induction, that a fact was named to him of a current being obtained from a length of 300 miles of gutta-percha covered wire half an hour after contact with the battery. I remember inquiring if he did not believe this difficulty was to be overcome, and I received from him every encouragement to hope it might. I at once earnestly urged on Mr. Whitehouse to take up this subject, and pursue it independently of every other experiment; and a successful result was at last arrived at on 1,000 miles and upwards of a continuous line in the submarine wires in the several cables, when lying in the docks. It did not rest upon one, but many thousand experiments; it was further proved on 2,000 miles of subterranean wire, in the presence of Professor Morse, while in this country, and beats from 230 to 270 per

minute were recorded, or equal to 12 to 15 words per minute.

In the Atlantic cable, the copper or conducting wire is composed of seven twisted wires formed into one, thus avoiding the danger of a flaw, which any single wire might be subject to; three separate coats of gutta percha are then laid one over the other, the wire being thus perfectly insulated. This gutta percha core passes and repasses in the course of its manufacture no less a length than 40,000 miles. The outer iron wires, of which there are 126 to each mile, are twisted into strands each containing seven wires, making an aggregate of 315,000 miles to the 2,500 miles of cable. The construction of the cable is under the control of Messrs. Bright and Whitehouse.

ELECTRO-MAGNETIC ENGINES.

Mr. T. Allan, whose improvements in electric telegraphs were mentioned with so much favour in the *Times* of the 8th and 22nd inst., has recently occasioned considerable excitement in Paris by the exhibition, at the desire of the Emperor Napoleon, of his electro-magnetic engines, which are unquestionably the most successful examples in existence of the application of electro-magnetism as a motive power. The engines were taken to the *Conservatoire des Arts et Metiers* on Tuesday, the 14th inst., by order of Gen. Morin, the President of the Commission appointed by the Emperor to examine and report upon them. On Saturday, the 18th, they were removed to the Tuileries for the inspection of the Emperor. We are not in a position to speak definitely of the result of these investigations, but we have reason to anticipate that the principle of the engines is about to be tested upon a large scale; and we are so well assured of its soundness that we shall look with confidence for the full success of the experiment. The main feature of Mr. Allan's invention consists in the application of electric currents, so as to form several electro-magnets in succession, by means of which several impulses shall be successively given in the same direction to a rod capable of being moved longitudinally to any extent which may be required. At the commencement of a stroke, the first of a set of keepers mounted upon the rod, is placed sufficiently near to the first set of magnets to enable them to exert an available force upon it, and to move it through the space that separates them. Therefore, when a current of electricity is applied to this first set of magnets, they accordingly draw down the keeper to them, and move the rod longitudinally through the space just mentioned. The next keeper is, by this means, brought within the same distance from its magnets, and the current of electricity is at the same moment cut off from the former and applied to these, which thereupon draw their keeper to them, and move the rod through an additional space or distance equal to the first; and the other magnets and their keepers will respectively act in a similar manner in succession, and thus complete the stroke of the rod; after which the opposite rod will be operated upon similarly, the reciprocating motion thus obtained being converted into rotary motion by means of the connecting-rod and crank in the ordinary manner. It will be easily seen that the arrangement of the parts may be very readily adapted to all practical purposes. In fact, nothing could possibly be more susceptible of convenient adaptation than these engines, which will work with equal efficiency whether the series of magnets be vertical, or horizontal, or inclined at any angle to suit the different circumstances of manufactures, locomotion on land, or the propulsion of vessels. Mr. Allan has also arranged a rotary engine upon analogous principles, and we have seen it produce very excellent results.

WALKER'S ELECTRIC RAILWAY SIGNALS.

At the meeting of the Royal Institution on Friday, March 20, Professor Faraday occupied a few minutes at the commencement of the evening in giving a brief account of Mr. C. V. Walker's mode of telegraphing electrically from one station on a railway to the next on either side; or from a break-down on the rail to either of these stations. Signal bells are arranged at such stations, each with its own battery; and the latter, being connected with the earth at one of their ends, are connected together at the other ends through the bells and the

telegraph line; but so that the batteries are *opposed* to each other as to the currents they can produce: hence there are no currents, and the bells do not ring. But when the wire between the bells is connected with the rail or the earth, then both batteries can send forth their currents, and both bells are rung. This necessary earth connection can be made at one station, and then the bell rings at the next. If a break-down occurs, the guard connects the telegraph wire where he is with the rail or earth, and the stations on both sides of the accident are warned. Provision is made at some of the line posts, about a furlong apart, where the man, by touching a key, can at once give the notice required. The method was illustrated by experiments with the bells and wire arranged by Mr. Knight.

ARTIFICIAL SAPPHIRES.

We learn from *Cosmos* that M. A. Gaudin last week communicated to the Academy of Sciences a process for obtaining alumina in transparent crystals, which present the same chemical composition as the natural stone known under the name of sapphire. To obtain them, he lines a common crucible with a coating of lamp-black, about half fills it with equal portions of alum and sulphate of potash reduced to powder and calcined, then completes the filling of it with lamp-black, covers it, and lutes it tightly. He then exposes it for a quarter of an hour to the fire of a common forge. The crucible is allowed to cool, and on breaking it, the surface of the lamp-black coating is found covered with numerous brilliant points composed of sulphuret of potassium. The crystals of alumina, or, in other words, real sapphires are obtained by dissolving the sulphuret from the mass by heat in a capsule. The size of the crystals is large in proportion to the mass operated upon; those obtained by M. Gaudin are about a millimetre (3·100ths of an inch) in diameter, and half a millimetre in height. They are so hard that they have been found to be preferable to rubies for the purposes of watch-making.

REAPING MACHINES.

We are informed that Baron Ward has given notice to the Imperial Agricultural Society of Vienna that he challenges all reaping machines, constructed in Europe or America, to compete with his (an improvement on Hussey's) patented in Vienna on the 10th of December, 1856, for the sum of 1,000 florins, to cut five Austrian jochs (nearly seven English acres) next harvest, on any ground in the Austrian dominions which the acceptor may please to choose. The acceptor has also the choice of rape, wheat, barley, oats, or clover, the only conditions being that the prize shall be awarded to the machine which does the work in the shortest time and the neatest manner.

Orr's Circle of the Sciences: Mechanical Philosophy: including the Properties of Matter, Elementary Statics, Dynamics, Hydrostatics, Hydrodynamics, Pneumatics, Practical Mechanics, and the Steam Engine. By the Rev. Walter Mitchell, M.A., &c. J. R. Young, and John Imray, M.A., &c. London: Houlston and Stoneman, Paternoster-row; William S. Orr and Co., Amen Corner.

This volume belongs to a work "undertaken," says the preface, "with a zealous desire to supply a series of elementary treatises on the various sciences, trustworthy in their modes of treatment and in their details, and written by authors who were masters of their subjects." The editor has, we acknowledge, succeeded tolerably well in his design. The whole work has been welcomed, as this volume deserves to be welcomed, by that large class of intelligent readers who require a general knowledge of science, but who have not the leisure to study with effect those elaborate works which are the favourites of professed students. The present volume is perhaps as well adapted to the wants of such inquirers as any which has appeared; for although it has some serious faults, to which we intend to point attention, yet it possesses qualities peculiarly adapted to the reader of little leisure and modest means. It is cheap; it is easy of reference by means of the index and table of contents; its general arrangements are intelligible, and its general teachings are correct.

Economy is the great desideratum in all human arrangements, as it is the principle governing all natural phenomena.. *Multum in parvo*—the greatest effect with the least expenditure of means—is our aim in all our attempts at usefulness. This principle should be prominent in every literary as in every other work; but especially should it be paramount in such a book as this before us. *All faults* are of course offences against the law of economy; but there are some in this volume which may be directly referred to it for judgment. There are two modes of infringing it, of which we shall give an instance or two from various parts of this

book; one kind where the statement of a principle is overdone with words; the other of an opposite kind, in which clearness and precision are sacrificed to brevity. Of the former kind is the dissertation on the divisibility of matter, pages 6—10, in which a great deal is said to very little purpose, and much of this is of a doubtful character and purport, referring to matters which are controverted, and therefore unfit for a place in a treatise like the present.

This chapter (the first) has a preliminary exposition of the various terms used with peculiar significations in the physical sciences. This collection of the definitions into one body at the opening of the book, by removing them from their proper neighbourhood, and detaching them from the subjects to which they are immediately related, has tempted their author to make each definition a small treatise in itself, to the waste of his energy and space, and of the reader's attention. Thus we have here, among other things of the same kind, an Essay on the Strength of Materials, occupying more than two pages of small close type. In this part we find the following:—"A body is subjected to extension when a weight is suspended below a fixed point; and in this case a body retains its form by its cohesion, assisted by its *rigidity*. When a weight is supported on a pillar placed below it, the pillar is compressed, while it plainly resists the effect by a repulsive force, but secondarily, also, by its *rigidity*." The use of the word *rigidity* here is to us, as no doubt it will be to most readers, somewhat enigmatical. It is difficult to conceive of rigidity as a force at once co-ordinate with, and independent of, cohesion or repulsion. Here, too, we remark, as might be expected from such an inverted order of things, that principles, not laid down till a subsequent section of the book, are used as demonstrated truths. Take this paragraph:

"A body of a pound weight, falling from the height of a yard, will produce the same effect in breaking any substance as a body of three pounds falling from the height of a foot, since their momenta are equal. If the pressure of one hundred pounds break a given substance after extending it through the space of one inch, the same will break it by striking it with the velocity that would be acquired by the fall of a heavy body from the height of half an inch; and a weight of one pound would break it by falling from a height of fifty inches."

In the first place, a knowledge of the laws of motion is necessary to the comprehension of this sort of reasoning, and these laws are not stated till the end of the part on *dynamics*. Again, the author speaks of a force of one hundred pounds striking a body with a certain velocity. How can a force strike a body in the way here proposed? Farther, it is not true that one pound in falling through fifty inches would accumulate an amount of *vis viva* which would enable it to do the work of one hundred pounds acting through the space of one inch. If, however, a body when extended *one inch* reaches the limits of its elasticity, and rupture takes place, and if its elastic force go on increasing in proportion as the elongation increases, from nothing to a hundred pounds at the breaking point, then the work done in producing the extension equals that done by a pressure of a hundred pounds acting through the space of *half an inch*, and equals the work accumulated in a weight of one pound falling through the height of fifty inches. This is the case which the author seems to have had in view, though he has not succeeded in making it very apparent.

The second part is on statics, in which we meet with a good deal of gossip about the various standards of measure, units of length, of pressure, of time, &c., which seems to have no *special* relation to the subject in hand. Additional brevity here would, we think, be desirable. The real business of the chapter is commenced by Duchayla's proof of the parallelogram of forces, which we have seen better performed elsewhere. The principal step in the reasoning, is to show that, if the proposition hold as to the direction of the resultant for P and Q, and also for P and S, it also holds for P and Q+S. Here the author, Mr. Mitchell, introduces four forces when the work is better done with three only, as in Hann's Mechanics. Professor Hann's version is both more complete and more concise than this.

At page 51 we find a proposition for the establishment of which a great deal of algebra is used, though we think its truth can be discerned much more clearly with the naked eye than through such mental spectacles. The rest of the statical portion of the volume is occupied by the theory of couples, of which a tolerably good account is given; and by the discussion of the properties of the lever, pulley, screw, &c., in which the only fault we remark is, that our author's use of algebraic symbols is rather too expansive, and has a tendency to overstep legitimate limits.

We next come to the chapter on "Dynamics," apparently by the same author. Here we have a notable inversion of the natural order of things. The solution of all dynamical problems is dependent on the three simple laws of motion. These laws are derived from experiments, and, admitting of no proof but the evidences of ascertained facts, are the results of the analysis of hosts of observations. They are usually taken

as the starting ground in treatises on this subject. Indeed they naturally form the first principles in the synthetical treatment of the phenomena of motion. Mr. Mitchell, however, defers the statement of them till he arrives at the end of his task. The reason for this we are at a loss to understand. The first law of motion, it is true, is given at the outset, but it is enunciated, not as an experimental law, but as a necessary truth. Speaking of uniform motion he says:

"It is plain that the motion spoken of, being neither unchecked nor expedited, nor its direction in any way interfered with, must be uniform in its *rate*, and rectilinear in its course—the course originally impressed."

To this kind of treatment of the first law of motion we decidedly object. Its truth is by no means so self-evident, that it can be perceived, either without an appeal to, or by a superficial use of observation. We may prove this assertion by a reference to the controversy which took place in our pages not long since. On that occasion, the disputants on one side denied strenuously the truth of all the laws of motion, and showed no mean ingenuity in the advocacy of their views. Their arguments, of course, had to be met by others of a nature quite different from that of the above extract.

In other respects this part of the book is very well performed. We notice, however, the following evidences of want of care in the composition:

"If a body move uniformly in the circumference of a circle, the force to which that motion is due must reside in the centre of that circle. This is only a particular case of the following more general proposition: namely, that if a body describe any curve, in virtue of a single force, from its wonted rectilinear path, that force must reside in a point such that, conceiving a line to join that point with the moving body, this line, moving with the body, must sweep over equal sectoral areas in equal times."

The author here can hardly mean what he states, because he implies that no body can describe a curvilinear path, unless under the action of a central force—a force whose direction always passes through one point. And this is not true; because it is quite possible for a body to pursue any curved course, with its velocity varying in such a way, that no force directed through a *constant point* could produce its motion. That is, the motion might be such, that there would be no point which would satisfy the condition stated in the above extract. The proposition might, with perfect truth, have stood thus:—if a body move in a curvilinear path, in such a manner that there is a certain point about which it describes equal areas in equal intervals of time, then the resultant force which sustains its motion is always directed through that point.

Related to the subject of centrifugal force is an exposition of the influence of the rotation of the earth upon its form. It is shown that, because the centrifugal force at any finite latitude is perpendicular to the axis of the earth, this force is oblique to the surface at that latitude, and is equivalent to two forces, one in the direction of the normal, the other in that of the tangent. The first tends to diminish the effect of gravity; the second tends to impress a motion on the materials of the globe towards the equator. This is followed by saying,

"On account of the solid materials of which the earth is composed, and the particles of which resist separation by their cohesion, the effects of centrifugal force are in some degree counteracted; but it is the general opinion of philosophers, that the present solid parts of the earth were once in a fluid or semi-fluid state—in fact, in a state of fusion, and that the outer crust has become solidified by cooling.

"But those portions of the earth's surface which still remain fluid, observably yield to the tangential influence of the centrifugal force. There is a tendency, as observation shows, in the waters north and south of the equator, to flow towards that circle; and as they flow from parts where the velocity of the diurnal rotation is less than the velocity at the equator, the streams from high latitudes are gradually left more and more behind in their lateral approach to the equator, where the diurnal velocity is the greatest. As this velocity is towards the east, we may therefore expect to meet with great westerly currents in the open seas north and south of the equator, which is conformable to experience."

Ascribing these constant ocean currents to the centrifugal force proper to the earth's diurnal motion as their cause, is, as our readers will perceive, a fallacy. To expect that the existence of the centrifugal force would cause permanent streams of the water of the globe to flow from the poles to the equator is very unreasonable. If such an effect were actual, then, in the course of years, all the water in the world would arrive at the equator—a state of things hardly to be conceived, much less to be looked for.

The true effect of such a force is to produce a permanent modification of the form of the earth's surface. We are taught by writers on hydrostatics, that the normal at any point of the free surface of a fluid whose parts have no relative motion, and acted on by any forces, is always coincident with the direction of the resultant force acting on the particles of the fluid at that point. Hence, if the water in the neighbourhood of the surface of the ocean were everywhere affected by a force passing through the same point within the earth, then the water would so arrange itself that its outer surface would be perfectly spherical, because this is the only kind of surface whose normals all pass through one point.

But in the actual state of things the centrifugal force, varying with the latitude,

causes the direction of the resultant surface-force to oscillate from one side to the other of the centre of the globe as we pass completely round the meridian. This of course can consist only with such a conformation as shall make the tangent plane at any point perpendicular to the line of action of this resultant force. When this form is once assumed, the tangential force arising from the diurnal rotation will no more cause any current towards the equator than will the force of gravity towards the pole. Some other reason, therefore, must be sought for those westerly streams to which allusion is made in the above extract. Their westerly direction is correctly accounted for by our author: he is wrong only as to their origin. The only adequate cause to which we have ever heard those phenomena referred is the vaporization of tropical waters in consequence of the great heat to which the sun subjects them. And this vaporization would produce the same effect if there were no centrifugal force, or no rotation of the earth—if the sun went round the earth while the earth stood still.

There is a problem which is closely related to this subject correctly solved in the next chapter, which is on hydrostatics. We have but one point to notice here; it relates to the subject of floating bodies, which is somewhat meagrely and not very lucidly dealt with. After indifferently defining stable and unstable equilibrium, &c., the author says:

"The centre of gravity is sometimes elevated above its original position, in a gale of wind, by the shifting of the cargo. If the elevation be sufficient to bring it above the metacentre, the vessel must capsize."

A very paradoxical state of things must, we should think, obtain when the cargo, *of its own accord*, shifts so as to raise the centre of gravity. The shifting of the cargo does not ordinarily endanger the ship by elevating the centre of gravity, but by changing the position of equilibrium.

Next is hydrodynamics, occupying only eight pages. Then comes pneumatics. To this we have no objections to make. The rest of the book is practical, and written by John Imray, M.A., &c. We think this the best portion of the book. It contains some very useful hints on mechanical drawing; a treatise on the strength of materials, to which, however, we can render only qualified praise; explanations of machines for expending wind and water power; and a treatise on the steam engine, to which we shall be unable at present to allude further than to say it is illustrated with well executed wood engravings of the details of the engine. These will prove valuable assistants to the reader.

Interest Commutation Tables for Changing at Sight any Amount of Interest, at 5 per Cent., into the Equivalent Amount of Interest at any other Rate, varying from 2½ to 10 per Cent. Also a Commutation Time-Table for changing the Number of Days, at 5 per Cent., into the Equivalent Number of Days corresponding to any other Rate, varying from 2½ to 10 per Cent. By CHARLES M. WILLICH. London: Longman, Brown, Green, Longmans, and Roberts. 1857.

The title-page of this little work (given above) speaks for itself, and we have so frequently commended the skill and accuracy with which Mr. Willich prepares his tables, that we need add nothing in his praise in bringing this new volume to the notice of our readers. Of the value of these Commutation Tables no well-informed person can have any doubt. We may add that, in addition to the two tables mentioned in the title-page, a third is given in the work, viz., A Table for the Valuation of the Decimal Parts of One Day's Interest, by showing the Amounts of Capital which Produce each Progressive Farthing in One Penny, and each Penny in One Shilling of Interest, at 5 per Cent., in one day and the decimal parts of a day.

PROFESSOR FARADAY AND THE CONSERVATION OF FORCE.

To the Editor of the Mechanics' Magazine.

SIR,—The principle of the conservation of force, in the most general sense in which it can be conceived, is as old as the opinion—however old that may be—that matter can neither be created nor destroyed; for having no direct knowledge of matter, being unable to form any other conception of it than this, that it is the seat, substratum, or upholder of forces, we have no other cognizance of its existence than by the impressions which these forces are capable of making on sentient beings. This indestructibility of matter is the conservative aspect of force viewed simply in respect to its abstract entity or mere existence; but it may be regarded in a manner less general, as action—as an entity in concrete palpable existence, through a display of its energy in the production of effects; and in this light it is as old as Newton's third law of motion, that action and reaction are equal and opposite. But there is a third and more modern aspect in which the principle of the conservation of force has been regarded, in which a still more limited view is taken of the nature and conditions of force. How it originated, and how it has grown up, I do not know; but the late Sir Richard Phillips, Herepath, Grove, and Faraday himself, I am inclined

to believe, have adhered to this hypothesis of the constitution and phenomena of nature. It is supposed that matter, in virtue of a constant activity of force, can never be coerced into quiescence; that it can never be still; but that it is eternally modifying and being modified, ever changing from one form of manifestation into another, from heat, light, motion, electricity, or other phenomena into each other, and back again in ceaseless circles of mutation; and whilst displaying itself in any particular form, is ever active therein with that peculiar motion by which, through corresponding appropriate sensations, it makes itself known to us in distinct phenomenal modes of existence.

This hypothesis may be varied a little by rejecting the notion that matter is unigeneous, and differs only circumstantially in the character of its forces, and by assuming that it is multiform through a variety of occult qualities as well as of forces; but as the conception of the diverse magnitudes of the ultimate particles of matter, which are the only varieties besides those of force of which we can form an imagination, is not excluded from the former assumption, the accessory idea of other properties appears to be both superfluous and purposeless; for we have no knowledge of matter, no perception of distinct classes of phenomena, but through the various sensations which various modifications of force are calculated to produce.

This conservation of force in the aspect of *motion*, as distinct from that of *action*, refers to the constant amount of an essentially phenomenal and dynamic manifestation; whilst in the latter aspect, force may be regarded as being at times and for a time, wholly inert in that respect, although not devoid in the meanwhile of a constancy of action in the mathematical sense of the term, and taken in a statical point of view. In this hypothesis of the invariable amount of motion, the doctrine—for it ceases to be a principle—of the conservation of force, supposes a ceaseless activity, an endless state of movement in the individual or aggregated molecules of matter, unchecked by those transformations in the character of the motion which constitute the various phenomena of nature, and perpetuated through all changes by equivalency in successive modifications. In this view of the subject, all antagonism of forces by which, until the equilibrium be disturbed, they become in respect to all outward manifestation latent, dormant, and inert, is excluded, as contrary to nature and the conservation of force. It must, indeed, be admitted that this latency of force is practically its destruction, but it is not really so; for in respect to its entity or abstract existence, and also to its operation in obedience to the third law of motion, the conservation of force remains intact; and it would be illusive to conceive that either of these axiomatic truths, or aspects rather of the same truth, concerning the indestructibility of force, would countenance the idea of the peculiar mode through which it is, by this hypothesis, supposed to be perpetuated or conserved. It will be seen, then, that this modern doctrine of conservation is not identical with the third law of motion, nor is it to be deemed a law of nature in any sense; for it does not stand on an induction from facts, but is an integral part of the hypothesis which it is thought that it supports. Deficient in axiomatic truth by its questionable, or at least uncertain character, it is not the test by which any conceptions of the physical conditions of gravitation can be tried; and yet such conjectures are undoubtedly amenable to the principle, rightly understood, of the conservation of force, as being the non-destruction of its existence, and the non-suppression, exhaustion, or deterioration of its energy.

Is, then, the generally-received notion of the force of gravitation contrary to this principle of conservation?—is it contrary to the idea of force being a constant quantity, not in respect to its *manifest* operation—for that, as we have seen, is a very different postulate, and, as I conceive, a very faulty hypothesis withal—but in respect to its potentiality and existence; is it, in fact, contrary to the third law of motion, or rather of force, as it might, by generalizing it a little more, with greater propriety be designated?

Before answering this question, it will be necessary to advert to a distinction that must be taken between the expression of the law of gravity in terms declaratory of it simply as a mathematical fact, and the same terms declaratory of it as the essential physical attribute of the force, independent of any conditions under which it may be exercised, and from which, only as a result, the mathematical fact may arise. That is to say, although it may be the law, it may not be the nature of the force, apart from all other reasons, to decrease in some manner with the increase of the distance; and *à priori*, the fact that it decreases with the square of the distance, and not with the distance simply, is a circumstance indicative of other circumstances being necessary to its decreasing with the distance at all. It is proper to insist on this distinction with some emphasis; for although Faraday himself has not overlooked it, an able opponent of his views, and a correspondent of yours, under the signature of "A Mechanic," and writing in an excellent spirit, has argued

the subject as though with himself he had confounded the two ideas, and has therefore indulged in much irrelevant matter. He could not, I imagine, have seen the concluding part of Faraday's lecture when he wrote. Now the popular conception—may I not say the scientific idea—of the force of gravitation, is, that its decrease according to the square of the increasing distance, is *per se* the nature of its action, through the influence of the distance alone—an opinion which Faraday very justly controverts, but which your correspondent is content to retain; and analogous to that of the diminution of the projectile force, by distance also, as lately maintained in your pages by Messrs. Hopkins, Mushet, and others. The question then is, whether *this* conception of gravitation, in which the law is understood to be expository both of the physical and mathematical fact, is contrary to the principle of the conservation of force, according to the right understanding of it, as a law of nature and of motion apart from those hypothetical notions from which I have thought it necessary first to clear it. Faraday says it is, and surely every philosopher, not biased by mathematical predilections, will agree with him.

It is not a question merely as to the mystery in which the subject is involved, or as to the difficulty, as your correspondent understands it, of conceiving *how* a force can in itself decrease; but it is whether this mere assumption of it as a fact, is not directly contrary to and utterly incongruous with an undoubted first principle in philosophy, and cannot therefore be a reality; if so, it is a fit subject for research, to inquire—not *how* about the impossible—but how it is that the actual phenomena accord with this false assumption, and how it is that although the law is right, the philosophy is wrong. Now, this is what Faraday proposes for investigation. He insists on keeping up the distinction, which Newton himself had made, between the mathematical and the physical fact; he recognises in a certain form of words a correct enunciation of a law of force as a legitimate induction from acknowledged facts, but he does not believe that this same formula enounces also a truthful representation of the *modus operandi* of that force; he sees that there is a discrepancy between such an account of the matter, and a great principle in nature. He cannot contentedly allow that force should be supposed to wax and wane spontaneously, and he asks the aid of philosophers to attempt to find a cause in the one case, and an effect in the other.

In adopting this course, Faraday may not certainly have evinced the mind of a mathematician, but he undoubtedly has displayed that of a philosopher, profound in his views, and ambitious of deep research. What is there to object to him in this, except perhaps that he has put forth unhallowed hands to touch the mathematical ark? As reasonably might an Aristotelian philosopher, charged also with a few Platonic ideas, have objected in medieval times that it was futile to attempt to reconcile the acknowledged fact of a decay in the projectile force with some alleged law of nature, founded on the supposed inductive principle of the inertia of matter, by any explanation which grovelling experimental pursuits could supply, inasmuch as the phenomenon was more intellectually accounted for by the diviner principle which pure reason sufficed to discover, that it is the nature of force and motion to decay, to become exhausted by its very display; and if this were in opposition to any other principle of inductive origin, "the best thing to be done would be to throw away such a principle at once." Now, Faraday does not walk on the high *à priori* road, and would reject such advice "at once;" he has no faith in occult attributes and ultimate properties when he sees an opening for investigation, through an inconsistency between an acknowledged fact and an undoubted principle, and true to his nature, he immediately begins to inquire into the matter; but whether the explanation is not nearer the surface than he seems to imagine is another question, upon which I shall have something to say presently.

Had the difficulty occurred in reference to the gravitating, as well as to the projectile force, our Aristotelian and medieval philosopher, under the cognomen and misnomer of "*A Mechanic*," might be imagined to have interchangeably said—"It is not my place, nor that of any other inquirer, to ask *how* any phenomenon [gravitation or projection] can be, or how any fact can exist, but merely whether it is or is not. What are the facts? and not how they can be? is the proper question to ask, and probably the only one we shall ever get answered." Our Aristotelian would here forget, that all probability whatever must expire, before the question, "How can facts be?" can be otherwise than pertinent. But he would proceed—"The effort to answer such questions as the above, seems to me to be like listening for that which is not audible, like straining the eyes to see that which is not visible. If I am assured of the fact that gravity varies inversely as the square of the distance [or when speaking of the projectile force—that it decreases by a law of exhaustion also, in some indefinite manner with the increase of the distance]—I

am satisfied, and shall not vex myself by inquiring how it can be so [how such a decay of force can in either case be brought about], though I should be glad to learn of any new discovery of related facts." Overlooking the somewhat inconsistent character of the last remark of our Aristotelian sage, we may *imagine*, that it would be quite in keeping with his medieval notions for him to add—" but the task of making such discoveries I leave to practical men and plodding experimental philosophers, as a pursuit incompatible with the serene and lofty spirit which a sublime geometry inspires, and with the intuitions and transcendental ideas associated with contemplations so divine." But now-a-days analysis and the higher mathematics very passably conduct to the same end.

In addition to the arguments advanced by Faraday on the subject, I would contribute this observation, that all analogy derived from the phenomena of force constrains us to believe that distance in itself—and consequently whether little or indefinitely great—cannot possibly possess any influence on the exercise of force. Why should it?—has space power? Nothing can modify force but what is itself force. But space is nothing—at least, it has no physical existence. Under whatever category of being, if it belong not rather to that of non-being, it may be classed—whatever indirect influence may arise therefrom in modifying the immaterial phenomena of sensational existence, it cannot interfere with or produce any change in force; in that respect it is wholly inert. Besides the metaphysical strength of this axiom, it is, as limited to the projectile force, an induction from facts, and on it indeed the whole Newtonian philosophy rests; whence, by analogy, we may be emboldened to generalise it for every description of force. Space, then, is a circumstance, indifferent to the intensity of the force of gravity, which therefore, *in its own nature*, remains constant for all distances; and this consideration helps us also over some of the difficulty, which all philosophers have felt, concerning the action of one body on another at a distance without an intermedium.

If, then, it is not to the extension of the distance that we must attribute a diminution of the force of gravitation—to what is it owing?—for that there is such a diminution in effects on the same body, is undeniable. Now, as such force cannot be absolutely lost, as Faraday justly observes, he is disposed to account for its disappearance by its being expended in the production of light, electricity, &c., or of some unknown class of phenomena which may in turn produce them. There is analogy in favour of this supposition, for we see that the diminution of projectile force is similarly accounted for, by its expenditure in the production of physical effects on a resisting atmosphere, in some proportion to, but not because of the distance. But is it necessary to have recourse to conjectures so recondite?—is not the fact sufficiently and more easily explained by the idea, that the force of attraction acts by a radiation *in space* and not *in lines*, as Faraday assumes; that it is a diffusible force, expanding as it progresses from its central existence, in ever enlarging concentric spheres of potential operation.

Consequently, it is not upon any line of radiation, but upon the space over which it exists by radiation, that the calculation of its force must be taken, and taken as to its totality thereon, and then the result will be quite consistent with the conservation of force; for, as the diminution of attraction is according to the square of the increase of the distance, so also is the enlargement of the area of its action, and consequently the compound ratio is ever that of equality. The attractive force, therefore, is ever intact, and in all its concentric spheres as wholes, and in all portions of them in radiating proportion, the amount of force for each is ever the same. This is a mathematical necessity, resting on the assumption of the expansiveness and diffusibility of radiation; and the assumption itself appears to be a physical necessity; for if the entirety of an attractive force, in the sense of its integrity, existed in lines of radiation—which is Faraday's idea—the attraction of every atom of matter, supposing distance to be indifferent to it, would exist in infinite force in every point throughout infinite space, because mathematical lines have no breadth, and may admit of an infinite number passing through an infinity of points. The finite nature of force, as well as the finite character of matter, leads to the inevitable conclusion that its radiation, equally with all material radiation, is expansive and diffusible; and, therefore, by mathematical consequence is governed, the one as well as the other, by the law of the inverse square of the distance. This law then results, not from the decay of the attractive force, either by distance or by the extraneous production of phenomena not proper to it—for that force, in its intensity and existence, remains, as we have seen, fixed and constant—but from its finite nature, and from the finite and physical character of the conditions under which it is exerted; and thus the law is found to be in perfect harmony with the principle of the conservation of force in general.

It will by analogy afford some aid to our

conceptions of the subject, if we consider what would take place in the case of a radiating emission of projectiles in a vacuum—say, of a quantity of small shot from the conical barrel of a gun. Every individual shot, unaffected by distance, would retain its projectile force throughout space, and the total force in the whole area at any distance occupied by the shot would be equal to that in the whole area at any other distance; and yet for a given area, within the spread of the shot, the force would vary inversely with the square of the distance. Here also the law appears to imply the destruction of force, because of a diminution unaccounted for except by the distance, which it also appears to imply is really the cause thereof; and yet we see evidently enough that the force in the shot, individually and collectively, is at all times and places the same; and that its amount being constant, the law is perfectly in accordance with the principle of conservation. The law is expository only of the result over a given area, or of the effect on an object of given superficial dimensions, and not of the modification of the force by distance; nor is it expository of any physical mode or circumstance by which the variation is produced. Here a corollary is suggested to the mind, which I beg to put in the form of a question,—Would an enlargement in the same bodies of the areas which they present towards each other, be an element in their gravitation?

In the conclusion of his lecture, Faraday very nobly contends for his right as a philosopher, although not a mathematician, to discuss such a subject as that which he has taken for his theme; and there is not a man in the world who is better entitled to exercise it. It is too much taken for granted that a mathematical turn of mind is tantamount to a genius for philosophy, and that their respective investigations are closely allied; whereas nothing can be more divergent, or bordering more nearly on incompatibility. Even putting the talent for experimental inquiries aside, the way in which things are viewed, reasoned on, and appreciated, are so different, that mathematical and philosophical acumen appear to require distinct idiosyncracies of the mental constitution; and these are never conjoined, except in a very few choice spirits of surpassing calibre of mind; and even with these, it seldom happens but that the one or the other of these especial gifts must be paramount before it becomes remarkable. For one Newton the world has had many Faradays and many Eulers, the one class being eminent in philosophy, but indifferent mathematicians; and the other, profound mathematical analysts, but miserable philosophers. Since talents of every description are honourable and useful, it were invidious to ask—except at times, when an overweening desire is manifested to magnify unduly the importance or the utility of a peculiar vocation—by which of these classes has the whole world, and even the world of science, been most profited?

I am, Sir, yours, &c.,

BENJN. CHEVERTON.

P. S.—Since writing the above, I have seen your last number, in which there is a review of Faraday's lecture, and a communication from a correspondent, Mr. Pitter, on the same subject. I have only time to observe, in regard to the first, that the "conservation of momentum," in distinction to that of force, is precisely that accessory idea, which, as involving an hypothesis, if not a fallacy, I have felt constrained to exclude from a principle, to which we may with confidence appeal, in a renunciation of the *physical* interpretation of the law of gravitation; for however true it may be in reference to the motions of the heavenly bodies, is it indubitable in regard to force in general? Are the molecular forces never in a dead lock, in which momentum, as such, has been destroyed in the act of producing with an inert result, an equilibrium of pressure, or else in effecting changes therein—in which it has been lost in one form as a live force, to appear in another as a dead force; conserved in action, but not in motion?

In Mr. Pitter's mode of treating the subject, he ignores one or the other of the fundamental principles of gravitation, either that it is in direct proportion to the mass, or that it is in inverse proportion to the square of the distance, or else he leaves the difficulty of the diminution just as he found it—unresolved; for in comparing the one hundred millions of particles in the second sphere with the one million particles in the first sphere, which is one tenth of the central distance, he increases the mass of matter one hundred times. Now, either this augments the gravitating force one hundred times, or it does not. If it does not, what becomes of the proportionality of the force to the mass? If it does, where is the law of the inverse square of the distance? To preserve this law intact, the reply must be that the force of the entire mass has been diminished. By what? The only answer that can be given is, by the distance; and thus the difficulty returns to us again. Or the reply might be varied by saying, that before the force is numerically magnified by the additional number of particles, it is proportionally diminished for each, by which the difficulty is merely transferred to the individual particle, and the question still recurs—whence this diminution? and the only answer is as before—distance. Distribution cannot apply to the force of a single particle. Mr. Pitter will see that it is in vain to account for the diminution of the total force by its distribution numerically on the one hand, if we increase it numerically in equal proportion on the other. Let me direct his attention to the corollary that I have mentioned, and he will see the point on which, though with similar views, we differ.

[If the discussion of this subject is to be continued in our pages, our correspondents must write with all possible brevity.—ED. M. M.]

REMARKABLE ATMOSPHERIC PHENOMENON.

About half-past ten on Tuesday morning (April 21), a curious and brilliant appearance was observed in the atmosphere, at Plymouth, by a great number of spectators, who appear to have been all so wonderfully struck with its character, that scarcely any two describe it alike; and whether the phenomenon really did assume the different modifications described by different persons, viewing it at comparatively moderate distances from each other, and all within the space of about half an hour, or whether the discrepancies are owing to a want of accurate observation, it is not easy to determine. The wind was N.W. and high, the atmosphere rather hazy, clouds high, principally cirri and cirro-cumuli, the weather fine and warm. "About half-past ten," says a spectator, "I was surprised by observing in the atmosphere an immense circle of bright white light to the westward of the sun, and reaching from the sun in a direction N.W. more than half way to the horizon. The sun appeared to be in one edge of the circle, and looked as if it were travelling in the bright orbit which the circle represented. At the point where the sun touched this white circle, it was intersected by another circle, or rather portion of a circle, which, extending from the sun, cut off a very large arc from the S.E. portion, and intersected it again to the southward. This second circle was distinguished by brilliant prismatic colours, and looked like a rainbow intersecting the white circle, the colours being most brilliant at the points of intersection, and the sun itself forming one of these points. The ends of this prismatic arc were not visible much beyond the periphery of the white circle. This appearance lasted about half an hour, and then gradually faded away." Another observer states that the prismatic arc was external to the white ring, that their peripheries were at some distance from each other, and that the sun was considerably to the eastward of the white ring, and within the prismatic arc. A third describes the prismatic circle as being nearly entire, and intersecting the great white circle, the sun being situated in the centre of the space included between the two intersecting arcs; but all agree as to the extraordinary brilliancy of the phenomenon.

FIRE-ENGINES *v.* WATER PRESSURE.

To the Editor of the Mechanics' Magazine.

Sir,—Your correspondent Mr. Walker commences his communication, at page 350 of your last Number, by telling us that he has "been thinking;" but from what follows I much fear that the communication in question was penned without having been preceded by any such process. He proposes to apply the pressure of the water-mains to reduce the amount of labour required to work the fire-engines. A little consideration might have shown him the absurdity of such a proposal; because the (assisting) pressure against the ascending piston being exactly balanced by the (resisting) pressure against the descending one, no increase of power could possibly result, and the number of hands required would remain unaltered.

If the pressure of the engine-power were superior to that of the mains, no useful effect could possibly arise from its employment; on the other hand, if the pressure of the main were superior to that of the fire-engine, the jet obtained would be that due to the water pressure alone, diminished by the friction of passing through the fire-engine; the engine itself, notwithstanding the pumping process, being perfectly inoperative.

The present practice, in all places where a sufficient pressure exists, is to attach the delivery hose direct to the main, without the engine forming any part of the circuit; a practice attended with the very best results. Many fires have been promptly stopped in this neighbourhood by this mode of proceeding, which saves time, and not merely *diminishes*, but actually saves *all* the labour and *all* the expense which would attend the employment of fire-engines. In many parts of England, in some parts of America, and on the Continent, the pressure of the water-mains has altogether superseded the use of fire-engines.

I remain, Sir, yours respectfully,

Wm. Baddeley.

13, Angell-terrace, Islington,
April 11, 1857.

SCIENCE AMONG THE SOLDIERS.

To the Editor of the Mechanics' Magazine.

Sir,—The enclosed slip, a verbatim extract from one of the most used and valued English Military Class Books is really *too good* not to be embalmed in your pages, as indicating the standard of science by which our youths are at present trained for *scientific* soldiers.

I met the passage by accident, while looking for other matter. I am, Sir, &c.,

A CIVILIAN.

April 14, 1857.

"Professor Shoenbein submitted to the British Association at its meeting at Southampton in 1846, a discovery of a mode by which cotton could be rendered so explosive so as to form an excellent substitute for gunpowder. He called this substance ozone."—"*A Treatise on Fortification and Artillery, by Major H. Straith, late Professor at Addiscombe.*" Fifth Edition. 1850. Pages 555—556.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

FARMER, G. J. *Improvements in hardening iron and steel.* Dated Aug. 23, 1856. (No. 1972.)

The patentee takes the ferrocyanide of potassium (the prussiate of potash of commerce), the hydrochlorate of ammonia (the sal ammoniac of commerce), and the nitrate of potash (the saltpetre of commerce), in equal proportions, or thereabouts, reduces them to a fine powder, and thoroughly incorporates them together. He then prepares a bath by mixing prussiate of potash 2 oz., saltpetre 2 oz., and sal ammoniac 4 oz. to every gallon of water. Having prepared these compounds, he heats the article he is operating upon until it has attained a red heat. He then covers it with the dry powder already described, which becomes immediately fused. He then plunges the article into the bath before described, where it is to be left until cold. When taken out it will be thoroughly hardened, and not only on the surface as in case hardening, but through the entire substance, unless the article be very large.

WADSWORTH, J. *Improvements in the ventilation of mines, and in removing noxious gases or vapors from places in which they accumulate or are generated, and in machinery or apparatus applicable to and to be used for such purposes.* Dated Aug. 25, 1856. (No. 1973.)

This consists in conveying gas or fire damp from the cavities in which it accumulates into some adjacent air course, by means of pipes through which the gas is drawn or forced by means of a fan, bellows, or pump; in the arrangement of parts of a certain portable machine for effecting the transfer of gases or vapours from place to place, and the use of such machine in removing gas or fire damp from the workings of mines into the levels or general air courses, &c., &c.

MENNONS, M. A. F. *A new composition applicable to the coating or covering of metallic and non-metallic surfaces.* (A communication.) Dated Aug. 25, 1856. (No. 1976.)

This consists of a composition applicable to the coating of walls, partitions, steam-boilers, &c. The patentee takes argillaceous clays of different kinds, and containing alumina. These clays are kneaded with water, and to the mass he adds in succession to 100 parts of clay, oily substances, or residues, 6 parts; oil sediment, 5 parts; fat, 2 parts; animal charcoal, 2 parts; vegetable charcoal 2 parts; mucilaginous substances, such as glue, &c., 1 part; wood saw-dust, or ground wood, already employed in the purification of oils, or in drying processes, 10 parts; waste hair, well beaten, 4 parts. To this he adds a decoction of logwood treated with nitrate of iron (to deepen the colour), together with a small proportion of soot. The whole is thoroughly mixed and brought to the consistence required.

WEBB, W. *An improvement in reclining chairs.* Dated Aug. 25, 1856. (No. 1977.)

This invention was described at page 300 of No. 1755.

BESSEMER, H. *Improvements in the manufacture of iron and steel.* Dated Aug. 25, 1856. (No. 1981.)

This invention was described at page 221 of No. 1752.

WARRINER, G. *Improvements in compounds for preserving, deodorizing, and fertilizing.* Dated Aug. 25, 1856. (No. 1982.)

This consists—1. In the use for the preservation of meat, fish, fowl, &c., of a compound of glycerine, or of sugar, of fat, or of any similar substance, in combination with water, alcohol, vegetable, animal, and mineral oils or oleaginous substances, and gelatine, gelatinous substances, and osmazone, one or more of them, as the case may be; to which, in some cases, may be added charcoal or other carbonaceous substances, lime, and ammonia, or some or one of them. 2. For purifying liquids, or for deodorizing and preventing their putrefaction, the patentee makes a mixture of glycerine, charcoal, and water. 3. For fertilizing he makes a mixture of glycerine and charcoal.

PERRY, J. *Improvements in photography.* Dated Aug. 26, 1856. (No. 1983.)

This consists, 1. in the use of chromic acid, or any of the combinations of chromium, as a mordant in photographic printing, for the fixation of iron or other metallic bodies, in conjunction with tannin, gallic acid, or pyro-gallic acid, or compounds containing the same. 2. In the use of the acetate or certain other salts of iron, with or without chromium, in the production of photographic pictures, when used in connection with the subsequent application of tannin, gallic acid, or pyro-gallic acid.

PERKIN, W. H. *Producing a new color-*

ing matter for dyeing with a lilac or purple color, stuffs of silk, cotton, wool, or other materials. Dated Aug. 26, 1856. (No. 1984.)

The patentee takes a cold solution of sulphate of aniline, or of sulphate of toluidine, or of sulphate of xylidine, or of cumidine, or a mixture of any such solutions, and as much of a cold solution of a soluble bichromate as contains base enough to convert the sulphuric acid in the above solutions into a neutral sulphate. He then mixes the solutions, and allows them to stand for 10 or 12 hours, when the mixture will consist of a black powder and a solution of a neutral sulphate. He then throws this mixture upon a fine filter, and washes it with water till free from the neutral sulphate. He then dries the substance, and digests it repeatedly with coal tar naphtha. He then frees the residue from the naphtha by evaporation, and digests it with methylated spirit, which dissolves out the new colouring matter. He then separates the methylated spirit from the colouring matter by distillation. To produce the lilac or purple colour, he adds a strong solution of the colouring matter to a dilute boiling solution of tartaric acid or oxalic acid, and works the material through it when cold.

Bush, W. F., and W. Hewitt. *Improvements in machinery or apparatus for grinding grain.* Dated Aug. 26, 1856. (No. 1985.)

To prepare millstones, the patentees reduce into a powder flint and other substances, and mix therewith seeds or grain of any kind, stirring the whole. Porousness is produced by the seeds when they have been discharged by heat, and have left cavities in their place.

Carey, C. *Improvements in shower-baths.* Dated Aug. 26, 1856. (No. 1987.)

The vessel to contain the water is arranged to slide up and down in the frame, so that it may, when to be filled, be lowered down to a convenient height, and be there supported by a folding bracket, &c.

Cowper, E. A. *An improvement in the manufacture of candles.* Dated Aug. 26, 1856. (No. 1988.)

This consists of the application of air, or æriform fluid, for expelling candles from their moulds. The patentee prefers to employ the pressure of atmospheric air forced in, or caused to press on the candles, at the tips of the moulds.

Caithness, Earl of. *Improvements in cutting or shaping stone and other substances.* Dated Aug. 26, 1856. (No. 1989.)

This apparatus consists of a set of vertical parallel bars of metal, arranged in suitable guides in a substantial framing, and furnished at their lower ends with steel or hardened metal cutting edges. These bars are actuated by a crank movement, the rotary action of which, or other driving power, elevates them to a certain height, when they are allowed to drop on the face of the stone, and thus chip away the material to the required extent. As the cutting bars are thus caused to operate, the stone being dressed, is caused to traverse at a slow rate between them, and hence, a fair, plain surface is produced. The same machinery may be employed for breaking masses of stone, as well as for reducing vegetable matters, such as gorse for feeding cattle.

Simpson, E. *An improved safety cage for mines and pits, or apparatus to be fitted to cages to prevent accidents from the falling thereof.* Dated Aug. 26, 1856. (No. 1990.)

This invention was described and illustrated at page 241 of No. 1753.

Newton, A. V. *An improvement in breech-loading cannons and other ordnance.* (A communication.) Dated Aug. 26, 1856. (No. 1992.)

The breech pin is provided with a number of expanding segments, operated by mechanical means, and caused to retire into a recess round the breech pin, to allow of the pin being inserted in or removed from the piece of ordnance, and also to expand laterally, and lock the breech pin in its seat.

Moore, J. and W. *A new or improved tap or stop cock.* Dated Aug. 27, 1856. (No. 1996.)

The body of the improved tap consists of a hollow cylinder at the middle of which is a conical valve bed or seat, on which rests a conical valve, and a stem from the under side of the valve passes through the bottom of the barrel. A coiled spring is placed between the valve and the top of the barrel of the tap. The fluid is delivered on the upper side of the valve, and keeps it close. On pressing up the stem, the valve is raised, and the fluid passes down the barrel and escapes by a pipe at the lower part.

Lees, T. *Improvements in lubricating parts of steam engines, and in apparatus and machinery to be applied for that purpose.* Dated Aug. 27, 1856. (No. 1997.)

The objects of this invention (which consists partly of improvements upon a patent, dated 22nd Aug., 1854), are—1. To admit the grease to the parts to be lubricated in small quantities, at short intervals, through an opening which can be enlarged or contracted at discretion. 2. To employ the same grease cup alternatively, either for rendering down animal fat, and transmitting the grease therefrom to the parts where it is required, or for the simple application of tallow or prepared fat or oil; and, 3. To enable the attendant to observe at a glance when the grease cup requires to be replenished.

Newton, A. V. *An improvement in projectiles for cannon.* (A communication.) Dated Aug. 27, 1856. (No. 1999.)

To a cannon ball or other projectile are attached knives or cutting blades, capable of lying sheathed within its periphery, but which on the discharge of the ball start out nearly at right angles, so as to cut away the rigging of ships, &c.

Newton, A. V. *Improved machinery for combing fibrous substances.* (A communication.) Dated Aug. 27, 1856. (No. 2000.)

In the machines (used to prepare long staple cotton) having a single circle of teeth, as in ordinary wool combers, the comb teeth are placed in an inclined position on the surface of a cylinder, and are operated in conjunction with a guard, whereby an indefinite number of circles of comb teeth may be employed.

Gardissal, C. D. *A mode of treating and preparing sea-weeds or marine plants for manure.* (A communication.) Dated Aug. 28, 1856. (No. 2003.)

The weeds are collected and brought by great pressure to the form of balls or cakes; or are first reduced by cutting or crushing machinery, and then condensed by pressure.

Gardissal, C. D. *A new manufacture of artificial fuel.* (A communication.) Dated Aug. 28, 1856. (No. 2004.)

This new fuel is composed of clay, coal dust, and a nitrate, or nitric acid. The mass is formed principally of clay. In burning ordinary bricks, bricks of this material not only bake or burn the others, but bake themselves, and may be used as ordinary bricks.

Brooman, R. A. *Improvements in shuttles.* (A communication.) Dated Aug. 28, 1856. (No. 2005.)

The body, web, or frame of the shuttle is formed of metal, to which are affixed metal pointed shoes or ends, and the frame is covered with gutta percha, or hardened caoutchouc, or horn, &c. The friction rollers are also formed of one of these substances, and are free to revolve upon spindles set in wooden blocks, one at each end of the shuttle.

Grautoff, B. A., and C. H. W. Albrecht. *Improvements in the construction of pressure and vacuum gauges.* (A communication.) Dated Aug. 28, 1856. (No. 2006.)

The improved pressure gauges were described and illustrated at page 269, of No. 1754.

Watson, T. *An improved beer-engine lever, or lifter, and apparatus for fitting the same to counters.* Dated Aug. 28, 1856. (No. 2007.)

The object here is to prevent cutting a hole or aperture in the top of the counter for the lever or lifter of beer-engines to work in, and this is accomplished by a peculiarly shaped lever, the fulcrum of which is a pin or axle free to turn in bearings affixed to the under side of an angle or flanged plate fixed immediately under the counter, or under a case fixed thereto, and slotted or cut out for the reception of the stud and the short arm of the lever to work through. The lever is in the form of a crank, and just behind the pin or axle it is curved back to fit over the edge of the counter or case; it then rises at right angles with the plane of the counter, and has fitted thereon, or not, any kind of handle which may be desired.

Feauveau, J. B., and L. A. Legrand. *An improved apparatus for the purification and the combustion of gas.* Dated Aug. 28, 1856. (No. 2009.)

This comprises an arrangement of gas burners, and the use of a purifying or filtering apparatus (which has the effect of a regulating apparatus also) which may be used with advantage apart from each other.

Sees, J. R. *Improved apparatus for heating the feed water of steam boilers.* Dated Aug. 29, 1856. (No. 2012.)

This is principally applicable to boilers wherein return flues pass through the body of the boiler into a chamber forward, and consists of a series of heating pipes placed in the smoke box, in connection with a double acting check valve placed outside the boiler and other parts which cannot well be described without engravings.

Brown, J. *Improvements in swinging hammocks, and in the construction of bedsteads or couches and in apparatus connected therewith.* Dated Aug. 29, 1856. (No. 2013.)

This invention requires engravings to illustrate it.

Fletcher, J. and W. *Certain improvements in the construction of weighing cranes or other similar elevating machines.* Dated Aug. 30, 1856. (No. 2014.)

This consists of improvements upon a previous one, patented 6th Feb., 1856, and described, with illustrations, at page 265 of vol. lxv. *Mechanics' Magazine.* These improvements consist—1. In altering the situation of the fulcrum of the weighing beam to any convenient position. 2. In an arrangement of self-adjusting apparatus for equalizing or counterbalancing the extra weight of chain, &c., upon the beam, in order that goods may be weighed at any point during the process of raising them.

Johnson, J. H. *Improvements in fire-arms.* (A communication.) Dated Aug. 30, 1856. (No. 2015.)

This invention was described and illustrated at page 367, of our last number.

BLAKE, J., and F. MAXWELL. *Improvements in the manufacture of soap.* (A communication.) Dated Aug. 30, 1856. (No. 2016.)

This consists—1. In forming a soap by combining soap or saponified matter (in the state called soft curd) with a neutral soap not deprived of its water. 2. In a mode of combining resin or resinous substances with alkali or alkaline leys, so as to obtain saponified resin, or a combination of resin and alkali to be used in the manufacture of resin soap.

GOODYEAR, C. *An improvement in combining gutta percha and asphalt or pitch.* Dated Aug. 30, 1856. (No. 2020.)

This consists in combining gutta percha with asphalte or pitch, by the aid of hot water; they are, when desired, further combined with sulphur, with India rubber, or other matters; and compounds are, when required, subjected to high temperatures.

CONANT, H. *A new and useful improvement in fire-arms.* Dated Aug. 30, 1856. (No. 2021.)

This consists in the application of a metallic ring and a chamber to the breech end of the barrel in breech-loading fire-arms, or to the forward end of the charge chamber of a revolver fire-arm, to prevent at the time of the explosion of the charge the escape of gas between the joint, against which the ring is pressed.

GREGORY, J. *An improved fish-joint or method of connecting rails.* Dated Aug. 30, 1856. (No. 2023.)

This consists in making the fish in one piece of a clamp-like form, and sufficiently deep to allow of a wedge or bearing piece to be inserted between the under side of the rail and the bottom of the fishing piece; this wedge piece increases the bearing surface, and prevents fouling of the joints.

BOWER, M., R. PEYTON, and J. W. DOWNING. *Improvements in metallic bedsteads, cots, couches, and other such like articles.* Dated Aug. 30, 1856. (No. 2024.)

This consists of methods of combining the parts of the above articles, which methods require engravings to illustrate them.

BOWRA, M. E. *Improvements in the laying or placing of rails or chairs for railway and other purposes in the shape of beds or springs, or elastic sleepers.* Dated Sept. 1, 1856. (No. 2026.)

This consists—1. In forming an elastic bearing in, on, or under the sleepers employed in railways, and in enclosing such bearing within a frame or box, whereby the same is protected from the external influences, and from spreading out or "spewing." 2. In constructing sleepers of hardened rubber, vulcanite, or other suitable elastic material.

HAWKINS, T. P. *A new or improved manufacture of wire chain.* Dated Sept. 1, 1856. (No. 2027.)

Wire chain is made from wire called half-round, that is to say, of wire having a semi-cylindrical, or nearly semi-cylindrical, section. The invention is particularly applicable to the manufacture of "double-link chain."

NORRIS, R. H. *Certain improvements in photography by the use of collodion in a dry condition, and for a means of transferring photographic films.* Dated Sept. 1, 1856. (No. 2029.)

This consists—1. In rendering collodion films capable of being used in a dry condition, by preserving their sensitiveness and porosity, by a method of transferring photographic films from glass plates to elastic plates of gelatine. A strong solution of gelatine is poured over the film, and permitted to dry. When dry it is coated with plain collodion, and may be readily stripped from the glass.

NEWTON, A. V. *An improved charger for shot-pouches.* (A communication.) Dated Sept. 1, 1856. (No. 2030.)

This relates to devices for securing the barrel of the charger to the pouch, and for gauging the charges. Also to an arrangement for locking and unlocking the gates or slides to prevent accidental opening and wasting the shot. Also to an arrangement of catches and springs for working and holding the charger more securely.

APPERLY, J. *Certain improvements in the process of preparing cotton, wool, flax, and other fibrous substances for spinning, and in carding and preparing machinery.* Dated Sept. 2, 1856. (No. 2037.)

1. The object is to ensure great regularity in the sliver or roving, by laying a condensed web or band of sliver delivered from one scribbling, carding, or condensing machine diagonally on the feed cloth of the following machine. 2. Instead of constructing the cylinder carding-engines or preparing-machines of wood, or of a single cylindrical casting, he forms the cylinder of several light tubular castings, and these he strings upon, and keys to a common shaft.

GUYET, P. J. *An improved method of stopping or retarding railway carriages and trains, and of warming the interior thereof.* Dated Sept. 2, 1856. (No. 2038.)

This consists in working brakes by steam brought from the locomotive boiler through a series of tubes and branch pipes into cylinders on each separate carriage, in which cylinders the steam works pistons, the rods of which are connected to levers or arms which actuate the brakes. The return stroke is effected by atmospheric air. The connections between the carriages are effected

by short pipes, one end of which is fitted into one end of the next adjoining, and a caoutchouc ferule is slipped over them, and has wire wound over it, whereby the joint is kept steam-tight, while sufficient play is allowed. The invention further consists in warming the interior of railway carriages by steam carried into them from the pipes which convey steam to the brake cylinders.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BARRAT, P. P. C., and J. B. *Improvements in steam digging apparatus suitable for draining and excavating purposes, parts of which are applicable to reaping.* Dated Aug. 25, 1856. (No. 1978.)

This consists of modifications of the steam-digging machinery, patented by J. H. Johnson, 10th May, 1853.

MARPLES, T. *Improvements in corn mills.* Dated Aug. 25, 1856. (No. 1979.)

These improvements require engravings to illustrate them.

PLUMMER, W. F. *Improved apparatus applicable to the grinding of grain and other substances.* Dated Aug. 25, 1856. (No. 1980.)

This relates—1. To a mode of closing the eyes of mill-stone cases, in which an exhaust or partial exhaust is maintained. The inventor mounts on the top stone an annular trough, which surrounds the eye of that stone, and into this trough dips a tubular projection from the case. In the trough he inserts water to make an air-tight joint, and thus prevents air from entering the case except by the eye of the top stone. The current of air down the eye he produces by an exhaust apparatus, &c.

HORTON, J. and T. *An improvement or improvements in the manufacture of paper, pasteboard, and pulp.* Dated Aug. 26, 1856. (No. 1986.)

This consists in the use of spent tan for the manufacture of paper, pasteboard, and pulp.

VIVIAN, R. W. *Economizing the consumption of fuel.* Dated Aug. 26, 1856. (No. 1991.)

This consists in supplying hot air charged with the vapour of water, so that the mixture shall come into contact with the waste gases, or the waste products of combustion, from fuel.

JAY, S., and G. SMITH. *An improved facing or covering to be attached to the outside of ladies' dresses, mantles, or other articles of attire, peculiarly adapted for the warmth and protection of the chest.* Dated Aug. 26, 1856. (No. 1993.)

To the outside of ladies' dresses, mantles, &c., a facing is adapted, ornamental or otherwise, for the warmth and protection of the chest.

HORRIE, L., and J. SCHOFIELD. *Improvements in the mode or method of extracting oil and grease separately from suds used in washing flannel and other woollen goods, for distilling the said grease or fatty matters, and in the apparatus employed therein.* Dated Aug. 27, 1856. (No. 1994.)

The inventors propose—1. To extract the oil from the suds by sulphuric acid. They filter them, and put the sediment into canvas bags, which they place on sheets of metal, and then pile them one upon another in a press, and subject them to pressure. Whilst in the press they heat the substances. 2. To extract the grease, they take the plates with their contents and place them in another press, then turn steam on them, and apply pressure. 3. To distil that grease, or any fatty matter, they take an ordinary distilling tube, and fix in the inside spouts or troughs as nearly as possible in contact with the grease or fat to be distilled, which spouts receiving the steam, condense and convey it away immediately.

GIRESSE, J. M. *A new machine to mince tallow and meat.* Dated Aug. 27, 1856. (No. 1995.)

This machine is composed of a wooden chopping table, at each end of which are fixed two grooved pieces to receive the standards which carry the apparatus. The standards are adjustable as to height. A revolving shaft is carried by the end standards, one end being prolonged to receive a geared wheel.

ROBERTS, S. *Improvements in regulating the supply of steam to engines working screw or submerged propellers, and in regulating or relieving the pressure of steam on slide valves.* Dated Aug. 27, 1856. (No. 1998.)

1. There is a cylinder with a piston employed, and the column of water external of the vessel presses on the piston, which has a tendency to be forced outwards against the pressure of the water, by springs or otherwise; the piston is in connection with the throttle or other valve, so that when the stern of the vessel is at its greatest depth in the water, the valve will be fully open; but when the stern rises, the column of the water pressing will decrease, and the valve will be more and more closed. 2. To regulate the pressure of steam on a slide valve, such valve is made in two parts, capable of separating from each other, yet connected by one part sliding in the other, there being a larger or less space between the two parts, according as it is desired to relieve the slide valve to a greater or less extent.

COLBECK, I. *Improvements in machinery for tearing rags, adapted particularly for*

shoddy or artificial wool. Dated Aug. 27, 1856. (No. 2001.)

The inventor places upon a framing a metal casing, and under this a drum and roller between the outer and an inner casing open at the top, for allowing the mungo to pass between the two casings. Within the inner casing he places a wooden cylinder covered with iron or steel teeth, the ends of the teeth being close to the casing. He then makes a small opening in the two casings, in which he places two grooved rollers, called feeders. He passes the rags between the rollers which carry them through until caught up by the teeth on the cylinder. The rags are then carried upwards to the roller and drum, when they become torn, and the small pieces or mungo pass over the inner casing in two directions, one towards an outlet in the outer casing, the other towards a door for the taking out of the mungo, the shoddy being still carried round between the teeth and the inner casing, until it falls off into a pipe placed for its reception.

GREEN, W., G. HOLLOWAY, and T. GRUBB. *Improvements in the manufacture of rugs.* Dated Aug. 27, 1856. (No. 2002.)

This consists in weaving the end borders of beam and Brussels rugs separately, and subsequently attaching the same, by sewing or otherwise, to the bodies of the rugs, the backs of which are woven beyond the ends for the purpose.

HEILMANN, C. *Improvements in furnaces of steam boilers.* Dated Aug. 28, 1856. (No. 2008.)

These apply chiefly to boilers with internal flues and fire places, and consist—1. In a connection between the fire doors (which slide up and down) and the dampers. 2. In a simple mechanism for opening the mouth of one, and closing that of the other of two air tubes, which pass from the front of the boiler to the top of the bridge underneath each of the fire places, whenever the corresponding fire door is opened for firing.

AVERY, J. *Improvements in bellows.* (A communication.) Dated Aug. 29, 1856. (No. 2010.)

This comprises a new combination of partitions, valves, and pipes, placed within smiths' or other bellows, so as to obtain a continuous regular blowing. The improved bellows is constructed with five boards encased in leather.

HERBELOT, A. L. A. *Improvements in obtaining motive power by gases or fluids.* Dated Aug. 30, 1856. (No. 2017.)

Compressed gas, or fluid, is introduced into an air-tight case, which contains a shaft that has a helix or thread of uniform breadth and thickness. The gas or fluid, by exerting unbalanced pressures on abutments, communicates rotary motion to the shaft.

LONG, F. *Improvements in life-boats.* Dated Aug. 30, 1856. (No. 2018.)

The improved life-boat may be shut up flat (like a pocket-book), by means of articulations or joints for stowage. To set it afloat, it is opened by a simple apparatus, and kept open by fixing the seats. It is framed of iron, and covered with a stout waterproof cloth.

POPE, J. *Improvements in the mode of cultivating and treating the hop plant.* Dated Aug. 30, 1856. (No. 2019.)

The inventor allows the hop bines to remain attached to the roots until the end of November, or till the sap has ceased to flow in them, by withdrawing from the earth, when the hops are ready for picking, the hop poles, by a slow motion screw or lifting jack, arranged to hold down the bines, raise the pole, and allow the bines to be laid on the ground without disturbing the root.

SUTTON, D. *An improvement in the manufacture of cast-iron cooking kettles and such like hollow ware.* Dated Aug. 30, 1856. (No. 2022.)

This consists in casting such articles each with a partition, which it is preferred should rise above the rim or upper edge; the two compartments are covered with separate lids.

HAMILTON, G. *Improvements in the treatment or finishing of textile fabrics.* Dated Sept. 1, 1856. (No. 2025.)

This relates to mechanical arrangements for imparting elastic finish to textile fabrics. It is also applicable to certain classes of goods for which existing finishing machines are unsuitable. The finishing effect is produced by working the threads of the fabric over each other whilst the fabric is drying, after being treated with starch or other composition; thus, whilst the composition stiffens the threads, they are prevented from adhering together. The piece of goods is held by its ends, and the warp threads are worked the long way of the fabric.

MONCKTON, E. H. C. *Improvements in blast-furnaces for smelting ores.* Dated Sept. 1, 1856. (No. 2031.)

This consists in causing the sides of the said furnaces to be surrounded with a series of air or gas channels, for causing the blast to converge from all sides upwards and downwards. The orifices above the melted metal are to be larger than those below the surface of the metal.

PROVISIONAL PROTECTIONS.

Dated December 12, 1857.

2954. Henry Wimball, of Aldermaston, Berks, manufacturer. Improvements in machinery or apparatus for the manufacture of bricks, tiles, pipes, and other articles of a similar nature.

Dated January 11, 1857.

288. Duncan Morrison, of Bordesley Works, Birmingham. A new or improved manufacture of ordnance.

Dated February 27, 1857.

578. Edward Mucklow, of Bury, Lancaster, manufacturing chemist. An improvement in the manufacture of "alizarine."

Dated March 3, 1857.

618. James Broad, of Drury-lane. The application of artificial boards, or papier maché, or patent composition boards, composed (or partly so) of any vegetable fibre, and the like, either in its raw state or worked up from old substances, to friction washers of every description of wheeled carriage and cart axles, also for covering wing and dash irons, and forming heel boards for Hansom cabs.

Dated March 7, 1857.

664. Eléonore Augustin Pagnerre, of Drury-lane, designer and engraver. A machine for counting, cutting, and inserting wire in blocks of wood for the purpose of printing and stamping on linen, calico, silk, cloth, and paper, and for all printing purposes.

Dated March 17, 1857.

746. George Farrell Remfry, of Riches-court, Lime-street, London, merchant. A portable apparatus for working punkas and whisks.

748. Thomas Dean, of Whittle-lane, near Burnley, Lancaster, power loom weaver. Improvements in looms.

750. William Edward Newton, of Chancery-lane, civil engineer. Certain improvements in artificial legs. A communication.

752. James Withnall, of Manchester, coppersmith. Certain improvements in the manufacture of rollers or cylinders to be employed for printing calico and other surfaces.

754. William McCulloch, of Kilmarnock, N.B., plumber, and Thomas Kennedy, of the same place, water meter maker. Improvements in stop cocks or valves.

756. John Fox, of Preston, builder. An improved music scale.

Dated March 18, 1857.

758. Thomas Yarrow, of Arbroath, N.B., engineer. Improvements in locomotive steam engines.

760. François Barthelemy Loubatières, of Agen, France, merchant. Improvements in the manufacture of paper, cardboard, and pasteboard.

762. Richard Talbot, of Moxley, near Bilston, Stafford, furnace builder. Improvements in furnaces used in the manufacture of iron.

764. Lewis Hope, of Bishopsgate-churchyard, London, merchant. Improvements in the manufacture of paper. A communication from H. Smith, of Canada.

766. John Horace Taylor, of New York, United States, engineer. Improvements in buckets and valve seats for bilge and other pumps.

768. Joseph Lewis, of Salford, Lancaster, machine maker. Improvements in machinery or apparatus for reaping and mowing.

Dated March 19, 1857.

770. Henry Armistead, of Colne, Lancaster, mill architect. An improved "picker" to be used in power looms for weaving.

772. Richard Archibald Brooman, of 166, Fleet-street, London, E. C., patent agent. An improved projectile. A communication.

774. Marie Amedie Charles Mellier, of Frews Weir Mills, Exeter, paper maker. Improvements in desiccating or drying paper and other goods in process of manufacture.

Dated March 20, 1857.

776. Thomas Sidebottom Adshead, of North End Mills, Stalybridge, Chester, cotton spinner, and Abraham Holden, of the same place, carder. Certain improvements in machinery for carding cotton and other fibrous materials.

782. Charles Weiss, of Huddersfield, commission merchant, Henry Lister, of the same place, manufacturer, and John Mitchell, of Sheepridge, near Huddersfield, finisher. Improvements in finishing woollen and other textile fabrics, and in the machinery or apparatus employed for that purpose.

784. Nathan James Greenwood, of Morley, near Leeds, woollen spinner. Improvements in spinning mules and slubbing machines.

786. John Chedgey, of the Grove, Southwark, engineer. Improvements in machinery for mangling, calendering, or pressing goods.

788. Isaac Atkin, of Nottingham, lace manufacturer, and Marmaduke Miller, of the same place, steam gauge maker. Improvements in dividing lace.

Dated April 1, 1857.

895. Charles Iles, of Birmingham, manufacturer. Improvements in bolts for doors.

897. Benjamin Horatio Paul, of Torrington-street, Torrington-square, Middlesex, chemist. Improvements in the preservation of stone, either natural or artificial, also of cements and other similar compositions.

899. Charles Greves, of St. Thomas-street, Southwark, gun maker. Improvements in breech loading guns and pistols.

901. Robert Adam, of Paisley, N.B., manager. Improvements in preparing and finishing threads or yarns.

903. Lambert Perin, engineer, of Paris. The easy discovery of flaws and escapes in gas pipes.

905. John Sugden, of Bradford, York, machine wool comb maker. Improvements in the manufacture of combs for combing wool, silk, cotton, flax, or other fibrous materials.

907. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Certain improvements in fire arms. A communication.

909. John Oliver, of Bow-lane, Poplar, Middlesex. Improvements in apparatus for manufacturing and conveying sulphuric acid.

Dated April 2, 1857.

911. George Lowry, of Salford, Lancaster, machinist. Certain improvements in machinery for heckling flax and other fibrous materials.

913. John Frederick Wieland, of Glasgow, gentleman. Improvements in portable apparatus and materials for cleaning the teeth.

915. Howard Ashton Holden, of Bingley Works, Birmingham, railway and general carriage furniture and lamp manufacturer. Certain improvements in carriage lamps and general carriage and harness furniture and fittings.

917. Edwin Maw, of the Doncaster Iron Works, Yorkshire. An improvement in the points of railway crossings.

919. Richard Archibald Brooman, of 166, Fleet-street, London, E.C., patent agent. Improvements in treating and bleaching fibrous vegetable substances, and in machinery employed therein. A communication from H. Bouchet.

921. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improvements in repeating fire arms. A communication.

Dated April 3, 1857.

923. William Henry Box, of East Looe, Cornwall, gentleman. An improved fish hook.

925. Stephen Barker, of Birmingham, manufacturer. An improvement or improvements in the manufacture of steel.

927. Richard Archibald Brooman, of 166, Fleet-street, London, E.C., patent agent. A machine for the manufacture of bolts and rivets. A communication.

929. David Joy, of Leeds, engineer. Improvements in steam engines.

931. Thomas Craddock, of Tachbrook-street, Pimlico, Middlesex, engineer. Certain improvements in the steam engine and steam boiler.

933. Félix Marie Baudouin, of Paris, manufacturer. Improvements in the wires or conductors of electric telegraphs, and in the machinery for the manufacture thereof.

Dated April 4, 1857.

935. John Bourne, of Billiter-street, Middlesex, civil engineer. The generation and application of motive power.

937. Henry Harvey and Robert Smith, both of Surrey-street, Strand. Improvements in raising sunken ships, other vessels, and all other matters and things from under, to the surface of the water, and to prevent their sinking.

939. Elkan Adler, of New York, United States, and Francis Barber Howell, of Lebanon, United States. Improvements in machines for cleaning knives and other similar articles.

941. John Austen, of Rue des Martyres, Paris, gentleman. Certain improvements for extracting silk and other textile and vegetable substances from the bark and leaves of every description of mulberry trees.

943. Adolphe Leclercq, iron manufacturer, of Trith St. Leger, near Valenciennes, France. Certain improvements in sleepers of railways.

945. Richard Birkin, Jun., and Thomas Isaac Birkin, of Nottingham, lace manufacturers. Improvements in the manufacture of figured lace.

947. Emile Testelin, of Ghent, Belgium. A new system for the application of electricity as a moving power.

949. William Sumner, of Preston, spindle maker. Improvements in machinery or apparatus for preparing, slubbing, and roving fibrous materials.

951. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in preserving food. A communication from P. E. Lemetteus and M. Bonière, of Rouen.

953. James Hansor, of Barnes, Surrey, practical chemist. Improvements in apparatus for consuming gas.

955. John James Rippon, of Oakenshaw Print Works, near Accrington, Lancaster, manufacturer. A new or improved instrument or apparatus for straining or filtering colours.

Dated April 6, 1857.

957. Thomas Melling, of the Rainhill Iron Works, near Prescott, Lancaster, engineer. Improvements in taps or valves, and in apparatus to prevent the overflowing of, and letting off, the water from baths.

959. George Tomlinson Bousfield, of Loughboro'-park, Brixton, Surrey. Improvements in treating India rubber and gutta percha, in order to render the same impermeable to illuminating and other gases. A communication.

961. Samuel Clarke, of Albany-street, Regent's-park. Improvements in the manufacture of candles and night lights.

963. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. An improvement in the construction of smoothing irons. A communication.

965. Charles Goodyear, of Leicester-square, Middlesex, gentleman. An improved manufacture of waterproof fabric, applicable as a substitute for leather, prunella, embroidered and other ornamental fabrics and stuffs.

967. John Horace Taylor, of Alma-street, Hoxton, Middlesex, engineer. Improvements in regulating the flow of fluids.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

983. Jean François Victor Larnaudès, of Montmartre, near Paris, gentleman. For the disinfection and deodorisation of animal and vegetable substances. Dated April 8, 1857.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," April 21st, 1857.)

2903. C. J. Lewsey and G. Nasmyth. Improvements in the treatment and application of woods used in the construction of casks and such like vessels, and for other purposes.

2913. J. Lillie and A. Dobson. Improvements in machinery or apparatus to be used in the processes of drying animal, mineral, and vegetable substances.

2918. A. M. Macé. A new manure for preventing the vine and other diseases arising from the soil, and for other similar purposes.

2932. J. Chatwin. An expanding compensating slide for sustaining gas and other lights, also applicable for other similar purposes.

2934. M. Burke. Improvements in mariners' compasses to counteract local attraction.

2940. W. Lund. An improved "spring clip" for holding or retaining loose papers or other loose articles.

2945. C. Humfrey. The application and use of paraffine in the manufacture of hair oils, ointments, and plasters for medical purposes.

2946. H. King. Improvements in machinery for thrashing and dressing wheat and other grain.

2954. H. Wimball. Improvements in machinery or apparatus for the manufacture of bricks, tiles, pipes, and other articles of a similar nature.

2955. J. Cawood, J. Beeson, W. Smith, and R. Henchley. Improvements in the valves of steam engines.

2956. J. H. Headley. An improved mode of manufacturing artificial granite in various forms, and plating or veneering the same with marble, so as to present an exterior of marble and an interior of stone or granite.

2958. S. Newington. Improvements in hand hoes and cultivators.

2960. G. Sherwin. Improvements in the manufacture of fire bricks, tiles, crucibles, and other articles when fire clay is used.

2961. G. T. Bousfield. Improvements in looms for weaving cut piled fabrics double. A communication.

2963. J. Smith. Improvements in Jacquard machines for weaving.

2967. J. Wadsworth. Certain improvements in heating and ventilating apartments, buildings, and ships, and in apparatus applicable to and to be used for such purposes.

2970. J. Grant. Improvements in heating or cooking by gas, and in apparatus for effecting the same.

2973. A. Fournier des Corats. Certain improvements in lamps.

2975. W. Austin. Improvements in pipes or tubes, and in the method of joining and laying the same.

2980. F. W. Gerhard. Improved means of obtaining aluminium metal, and the adaptation thereof to the manufacture of certain useful articles.

2983. J. Smith. Improvements in machinery for pumping.

2996. J. Eloe and S. Hartley. Improvements in machinery for moulding.

3004. F. Donny. Improvements in the manufacture of lamps.

3015. T. White. A new or improved manufacture of boots, shoes, and other coverings for the feet.

3039. J. R. Dick. Improvements in window-sashes.

3044. J. Lark. Improvements in kilns for burning materials in the manufacture of lime and other cements.

3050. W. MacNaught. Certain improvements in steam engines.

3065. W. Irlam. Improvements in the construction of railway turn-tables and weighing-cranes.

3084. I. Atkin and M. Miller. Improvements in folding lace, paper, and other fabrics.

3092. J. L. C. Le François de Grainville. Certain improvements in heating-apparatus.

113. R. Russell. Improvements in stoves and fire-places.

557. M. H. Picciotto. Improvements in preparing flax, hemp, and other fibrous substances.

627. W. Taylor. Improvements in the manufacture of iron and steel.

632. T. Brown. Improvements in capstans.

698. W. C. Day. Improvements in portmanteaus.

746. G. F. Remfry. A portable apparatus for working punkas and whisks.

751. M. Anquetin. An improved traveller's watch.

821. J. A. Zibelin. Improvements in the fabrication of artificial wines, brandy, and vinegar.

879. J. H. Johnson. Improvements in warming and ventilating apartments. A communication.

883. A. J. Quinche. Improvements in apparatus for counting, registering, and indicating the distance travelled by vehicles.

889. G. Lauder and T. Ireland. Improvements in the manufacture of brine to be used in the manufacture of salt.

901 R. Adam. Improvements in preparing and finishing threads or yarns.

931. T. Craddock. Certain improvements in the steam engine and steam boiler.

945. R. Birkin, Jun., and T. I. Birkin. Improvements in the manufacture of figured lace.

959. G. T. Bousfield. Improvements in treating India-rubber and gutta percha, in order to render the same impermeable to illuminating and other gases. A communication.

961. S. Clarke. Improvements in the manufacture of candles and night-lights.

963. A. V. Newton. An improvement in the construction of smoothing-irons. A communication.

983. J. F. V. Larnaudès. For the disinfection and deodorization of animal and vegetable substances.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

871. Henry Meyer.
877. Frederic Barnett.
890. Julian Bernard.
891. Julian Bernard.
892. John Rowley.
894. Henry Hucks Gibbs.
897. Jean François Felix Challeton.
916. Frederick Buonaparte Anderson.
924. Henry Bernoulli Barlow.
935. Moses Poole.
960. Joseph Barling.

LIST OF SEALED PATENTS.

Sealed April 17, 1857.

2419. Edward Tombs.
2421. Ferdinando Foggi.
2449. Charles Humfrey.
2450. Joseph Harrison.
2454. James Young.
2457. John Thomas Forster.
2468. Peter Armand Lecomte de Fontainemoreau.
2489. Nehemiah Brough.
2498. George White.
2551. Constantine John Baptist Torassa.
2622. William Spence.
2700. Nicolas Pierre Joseph Leseure.
2948. Louis Joseph Frédéric Margueritte.
334. Henry Smith.

Sealed April 21, 1857.

2470. William Smith.
2480. Godfrey Ermen.
2485. John Francis Porter.
2488. John Macdonald.
2490. Albert Demerit Bishop.
2491. Theophilus Horrex.
2497. Isaac Bailey.
2530. Joseph Armstrong.
2548. David H. Whittemore.
2570. Thomas Ainsley Cook.
2574. William Joseph Curtis.
2576. Samuel Tearne and George William Richmond.
2577. James Nasmyth and Robert Wilson.
2580. Eugène Napoléon Cadet.
2596. Charles Titterton.
2598. William Edward Newton.
2600. Herbert Keeling.
2609. George Collier.
2625. Louis Joseph Victor Vuitton.
2633. William Morphet.
2638. Richard Archibald Brooman.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subjects of Design.
Mar. 25	3960	W. Blain	Lancaster	Chimney top.
26	3961	Foster, Porter, & Co.	Wood Street	Westonian tie.
27	3962	J. Lyons & Sons	Finsbury	Travelling bag.
28	3963	J. Taylor	Bristol	Safety harness.
,,	3964	M. Bowden & Co.	Bristol	Disk advertiser.
30	3965	J. Spencer	Yorkshire	Sack lifter and weighing machine.
April 3	3966	J. Adams & S. Hilton	Islington	Bridge for furnaces.
,,	3967	J. S. Tabberner	Trafalgar-square	Mounting for scabbards.
4	3968	C. Gammon	Bloomsbury-square	Watch protector.
7	3969	F. Baker	Marylebone	Coal box.
16	3970	G. E. Oldham	Portman-square	Sansapareil shirt.
20	3971	H. J. Pemberton	Tottenham-court-road	Signal lantern.

PROVISIONAL REGISTRATIONS.

Mar. 24	864	G. Ramsford	Birmingham	Alarm apparatus.
,,	865	W. Power	Holborn	Portfolio.
25	866	W. H. Appleton	Drury-lane	Cinder sifter and box.
26	867	J. R. Dicksee	Fitzroy square	Infants' feeding bottle.
27	868	Turnor and Showell	Birmingham	Balance for a pen-holder.
28	869	T. Challinor	Fleet-street	Safety brooch catch.
30	870	T. Groom	Southwark	Self-adjusting shirt front.
,,	871	W. Flint	Acomb, near York	Sawing machine.
April 3	872	J. James	Worcestershire	Needle case.
,,	873	J. Vaschofski	King's-cross	Reversible trowsers.
6	874	G. F. Rose	Birmingham	Reference file.
11	875	E. H. Nühleirfels	Chelsea	Folding perambulator.
,,	876	D. Hyam	Bristol	Trowsers.
15	877	R. Donaldson	City-road	Impregnable envelope.
17	878	Parker and Thompson	Sheffield	Carpenter's brace head.
18	879	S. Wilks	Bedford-row	Globe or shade cleaner.
,,	880	C. E. Bull	Norfolk	Cot for children.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris: Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1760.] SATURDAY, MAY 2, 1857. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

ROSS'S MACHINE FOR CUTTING AND FORGING FILES.

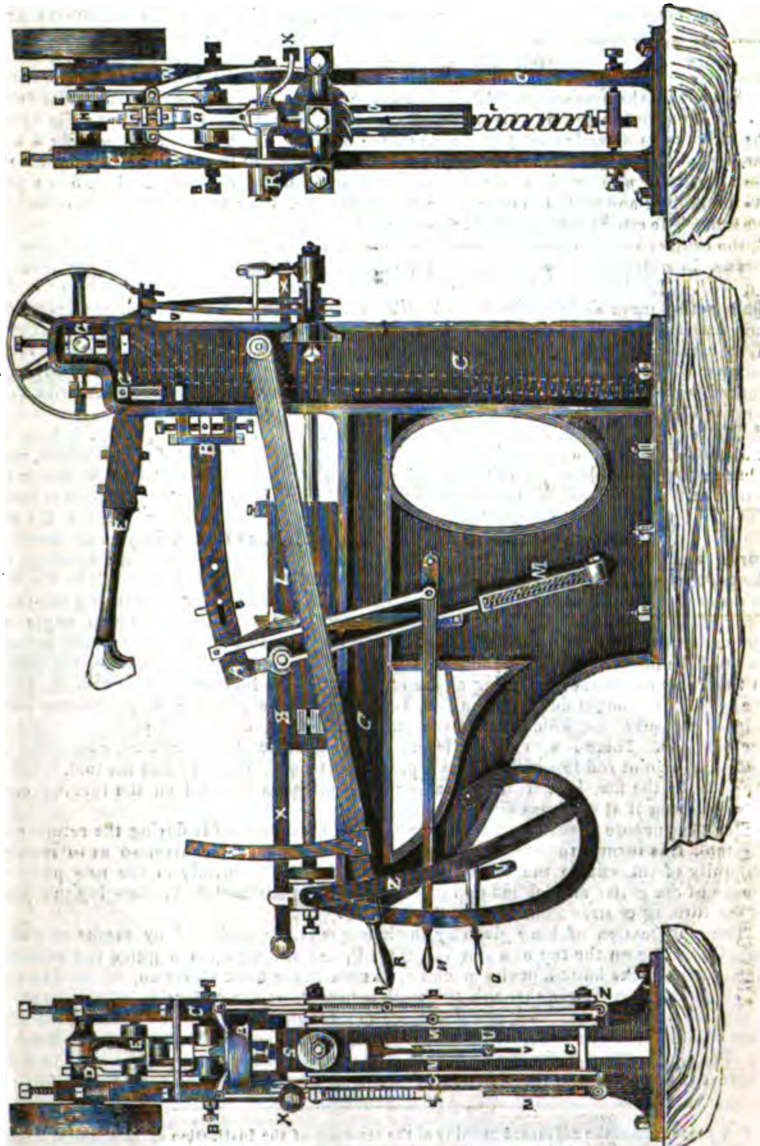


Fig. 3.

Fig. 1.

Fig. 2.

ROSS'S MACHINE FOR CUTTING AND FORGING FILES.*

THE chief difficulty in the application of machinery for file cutting appears to have been the want of a proper modification of blow, suitable to the various depths of cut and breadths of the file required; and also the proper adaptation of the teething tool, so that it may be steady in its action in the direction of the length of the file, and at the same time free to follow the transverse variations which occur when the tool is held at an angle across the taper part of the file, or any other variations which may occur, the files being often very far from level.

In the machine described in the present paper, and shown in the accompanying engravings, as now applied by the inventor for file cutting, the action in hand cutting has been followed as closely as possible. The machine consists of a hammer for striking, mounted in a cast-iron frame, working in connection with an arm for holding the tool; the hammer as striker and the arm as toolholder are fixed in the framework in the same relative position as the striking and holding arms of a man while in the act of cutting a file by hand. Fig. 1 is a side elevation of the new machine; fig. 2 is a front elevation, and fig 3 a back elevation. Fig. 4 is a side elevation of the principal parts of the machine to a double scale, the framework and handles in front being removed where necessary. Fig. 5 is a plan of the toolholder and tool for cutting the teeth, and fig. 6 is a transverse vertical section of the same. The arm or toolholder, A, figs. 1 and 4, is suspended in centres B, in the framework, C, the centres being arranged to work in slots in which they are adjusted by means of set screws, in order that the arm and tool may be conveniently adjusted to any inclination required. The lifting motion of the arm is imparted to it by an eccentric D on the driven shaft acting upon a curved lever, E, bolted to the arm, A. The hammer and lever, F, are mounted in the frame, C, on suspension centres, G, at the necessary height above the arm, A, to correspond with the inclination of the chisel or tool, it being necessary that the hammer should fall at the same inclination at which the tool is held. The lever, F, is worked by a vertically acting cam, H, imparting to the hammer the required rise and fall for the blow.

The tool or chisel, I, is fixed in a moveable round block of iron, J, fig. 5, into which two double centres are inserted, the one centre resting in the tool and toolholder, and the other in the moveable block and toolholder; the centres are adjusted by a wedge or cotter acting on a slip of steel, K, turning on a pin joint, into which one of the centres is inserted. The tool by this means is kept steady in the direction of the length of the file, L; and at the same time is allowed to turn or rock on the centres, so that it may at all times come fair to the face of the file, independent of all transverse irregularities that may occur in the file to be cut. These irregularities of surface are chiefly felt at the point of the file, where, in consequence of the oblique position of the tool across the file, the varying thickness or taper of the file exposes a varying surface in proportion to the horizontal angle of the tool across the file or the obliquity of the cut; the one side of the tool being nearer the point of the file than the other, and consequently on a thinner part of the file, the difference in thickness of course increasing as the taper of the file increases. The arm, A, carrying the tool, I, is brought down on the file, L, by means of a pair of springs, M, one on each side of the machine, which keeps the curved lever, E, constantly pressing against the eccentric, D. There is also a hand lever, N, on each side of the machine, connected to the tool, I, by a joint rod to which a spiral spring is attached, which brings the tool, I, and arm, A, down on the file, L, and at the same time commands the tool on the turning centres, so as to bring it at all times fair to the face of the file.

For the purpose of making the reverse oblique cuts on the file during the return course, the tool, I, is turned round in the toolholder after the first course, so as to reverse the obliquity of the cut to the extent required, and adjusted firmly in the new position by means of the cutter and jointed slip of steel, K, in the toolholder, A, changing the position of the turning centres from 1—1 to 2—2, fig. 5.

The modification of blow given by the hammer is accomplished by means of a vertical bar, O, resting on the top of a spiral spring, P, and sliding upon a guide rod which rocks upon pivots at the bottom of the machine, as seen in the back elevation, fig. 3. The spring, P, exerts its elastic force through the sliding bar, O, on the underside of the lever, F, on which the hammer is fixed. The sliding bar, O, is shifted in front of or behind the suspension centre, G, of the lever, F, by means of the crank-arm, Q, worked by the hand-lever, R. The elastic force of the spring is thus made to regulate the force of the blow in different degrees in proportion to the distance of the point of action of the spring on either side of

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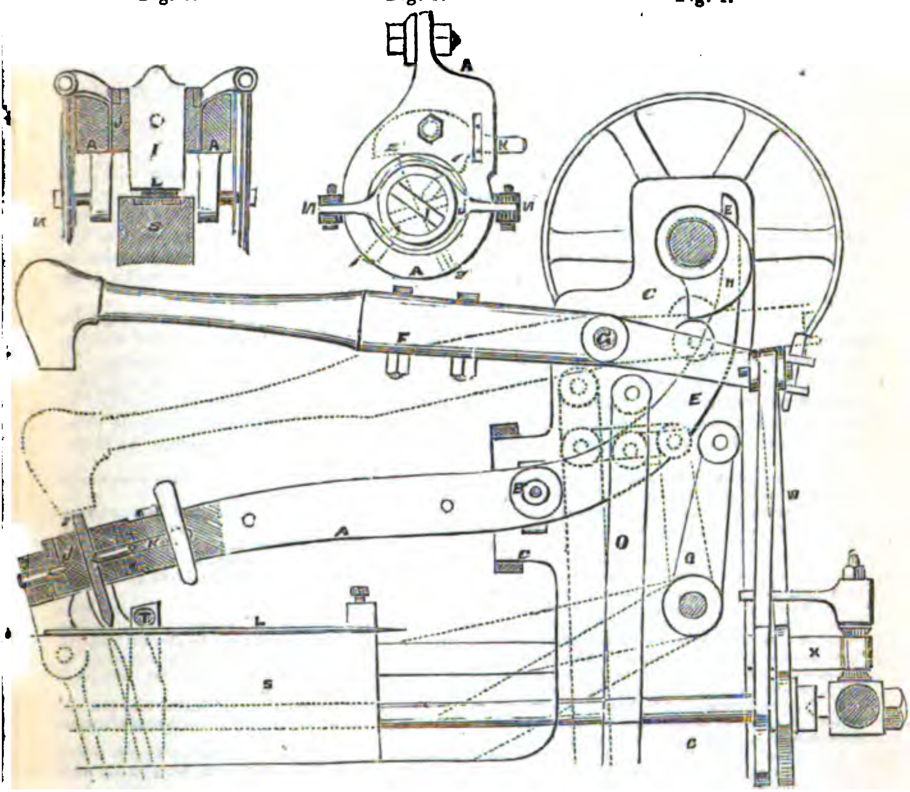
* A paper read at the adjourned meeting of the members of the Institution of Mechanical Engineers, in the Scottish Exhibition Rooms, Bath-street, Glasgow, September 18, 1856.

the suspension centre, G. If moved to the extreme distance in front of the suspension centre, G, as shown by the dotted lines in fig. 4, the hammer will be completely poised and prevented from striking; and if removed to the extreme distance behind the centre, as shown by the full lines in fig. 4, the hammer will strike with its greatest force, the recoil of the spring, P, being then added to the force of the hammer in falling: at any point between these two extreme positions the effect of the blow will be proportionate to the distance at which the spring acts in front of or behind the suspension centre, G. By this arrangement the force of the blow struck by the hammer is completely under the control of the person in charge of the machine by the adjustment of the hand lever, R.

The file, L, to be cut is fixed by the tang upon the cast iron block, S, which slides on a horizontal bed on the framework, C; beneath the file there is a bed of lead or composition to preserve the teeth on one side from injury while the other side is being cut. The file is also held down on the block, S, by a binding roller, T, carried in a frame sliding

Fig. 6. Fig. 5. Fig. 4.



vertically upon the framework of the machine, and pressed firmly down by a plate spring U, which is held down by a pin inserted in a series of holes in a circular arm, V, so as to afford the means of adjusting the pressure; the roller, T, is thus made to bear with uniform pressure on the surface of the file close to the cutting edge of the tool, I. The roller by the pressure of the spring, U, binds the cast iron block, S, to the frame of the machine, and likewise the file to the block, thereby ensuring a solid blow.

The binding roller, T, also serves the purpose of filing after the first cut, a process which is adopted in hand cutting to smooth down any irregularities that may arise from what is termed the first course; the roller being hard, and pressed firmly down on the file whilst traversing its entire length, answers the above purpose of filing or smoothing in the machine, and also saves time.

The feed motion between each blow of the hammer is imparted to the block, S, carrying

the file by means of two stampers, W, attached to the back end of the hammer lever, F; by the depression of this end of the lever the stampers communicate motion by means of a screw and ratchet wheels to the block, S, on which the file is fixed. The ratchet wheels act in opposite directions, and the motion of the block, S, is reversed at the end of each course by means of the handle, X, by which one of the stampers, W, is thrown out of gear and the other into gear. Each depression of the back end of the lever, F, moves the ratchet wheel one tooth, thereby moving the block, S, through the necessary distance for each cut to be made in the file, the ratchet wheels being changeable, and the number of teeth in the ratchet being proportioned in each case to the pitch of the screw and the number of teeth per inch required for each particular kind of file.

By these arrangements the separate motions of the hammer, F, and file block, S, are carried on until the tool, I, arrives at the end of the file, L, when a wedge-shaped stud on the end of the block, S, comes in contact with an adjustable curved bar, Y, on the hand lever, R, and pushes it out laterally so as to liberate it from the notches in the guide, Z; the lever, R, immediately falls, bringing the sliding bar, O, in front of the suspension centre, G, of the hammer, and thereby stopping at once the whole movement of the hammer, until another file is fixed, and the lever, R, again brought in gear, when the machine comes into action as before. The machine is stopped in the same manner at the end of the return course. At the point of the file, however, the boy in charge of the machine generally relieves the lever by hand, in order to regulate the force of the blow at the extreme point of the file, allowing the lever to fall when the file is finished.

One of these machines, with the attendance of a boy, will cut about four dozen 14 inch files per day, the attendance of the boy costing about 1s. 6d. The cost of the same amount of labour by hand is from 12s. to 14s., according to the kind of file, and the time about two days and a half. The files cut by the machine have been tested by many parties, and found to be generally equal to the best hand-cut files. These machines may be seen in full operation at Messrs. Hetherington's, in Glasgow, where they have been working for upwards of six months.

It is considered that this construction of hammer may be adapted with advantage for general light forging, such as files, or bolts, or any other light work where active striking is principally required, the force of the blow being regulated on the same principle for forging as for file-cutting; the lever for regulating the blow may be brought to any position convenient for the workmen employed at the hammer, and may be worked either by foot or hand, as desired. A heavy hammer might be controlled by hand on the same principle, and the force of the blow regulated according to the nature of the work to be done.

After the reading of the paper, the chairman, Mr. J. Whitworth, inquired whether there were any of the machines in regular work, and what was the finest cut of file made with them.

Mr. Ross replied that there were now six of the machines at work, some of which had been working for eight months; the finest cut of file yet made with them was common smooth and second cut, specimens of which were exhibited; but the machines were capable of cutting finer.

Mr. Fothergill asked whether in raising the tooth of the file it was necessary, as had been often asserted, to give a certain back action of the hand in file cutting, which was supposed to present an insurmountable difficulty in attempting to apply machinery to the purpose.

Mr. Ross had not found such an action necessary, and indeed did not see how it could possibly take place, as the man could not draw back the tool while striking. It had often been stated that file cutting required a peculiar turn of the hand, but it appeared to him that this turn could not be given whilst the blow was being struck, otherwise the hand would check the blow; and the tooth could be raised up by the effect of the blow, only in the particular position in which the chisel happened to be at the moment of the blow being struck, which could consequently be correctly effected by a machine.

Mr. Fothergill was glad to hear that explanation, as the mechanical operation of cutting files did not appear an exceptional one, that would not admit of being repeated by machinery like other mechanical processes, if suitable means were adopted.

Mr. Neilson agreed that the machine was very ingenious, but felt strongly of opinion that it would not be quite equal to hand work in throwing up the cut. There would be a difficulty, particularly with fine cut files made by the machine, which he thought would have little more than a line or slight groove cut without the necessary burr; and he thought the specimens of fine files exhibited were not quite equal to hand-cut files.

Mr. Johnstone thought that there was a good burr shown in the machine-cut files exhibited, and that the work was very satisfactory; it did not appear to him inferior to ordinary hand-cut files.

Mr. McFarlane thought that in hand-cut files there was sometimes a defect of an opposite nature, the burr being left too high, so that it was weak and soon broke down, and the machine would have an advantage of more certain and uniform regulation in this respect.

RECENT IMPROVEMENTS IN SMALL ARMS AND ORDNANCE.

UNDER the old system of manufacturing small arms by contract, it was found, not only that the arms of the various makers differed from each other, but also that those sent out from the same factory were by no means alike in all their parts. This was an important defect, and in order to remove it, and render the similar parts of all arms of the same class so perfect and so exactly alike as to be mutually interchangeable, the Enfield manufactory was established at an enormous expense. During the war, a sum of money was placed at the disposal of Mr. Whitworth, for the purpose, as was understood, of affording him the means of making experiments, to ascertain in what way the manufacture, and, if necessary, the form, of small arms could be best improved, the same end—the reproduction of exactly similar weapons—being, of course, still in view. Mr. Whitworth was selected for the purpose, we presume, on account of the repute he had acquired for a remarkable facility in detecting mechanical imperfections of the minutest kind, even down, it is said, to superficial inequalities of one-millionth of an inch; it being assumed, in all probability, that a person uncommonly skilful in detecting imperfections, would also display considerable skill in removing them.

But little was heard, however, of Mr. Whitworth's progress, beyond the fact that he had very wisely erected a closed gallery for experimental purposes, until the appearance in the *Times*, of Friday last, of an article giving an account of a series of trials made at the School of Musketry, Hythe, with an Enfield-manufactured rifle, and an improved rifle with a spiral bore, polygonal in section, the invention of Mr. Whitworth. Without the smallest desire to detract from the just merits of Mr. Whitworth, or, indeed, to reflect upon that gentleman in any way whatever, we think it desirable to notice this article, both on account of the absurdity of some of its statements, and the importance of some of its omissions.

The article in question states that the Whitworth rifle excels the Enfield in accuracy of fire, in penetration, and in range, to a degree which hardly leaves room for comparison; and then proceeds to laud the success of Mr. Whitworth's efforts, to compliment the sagacity of Lord Hardinge in selecting Mr. Whitworth for such a purpose, and to urge the general adoption of the Whitworth rifle throughout the service. This course we consider to be most unwise. We grant that Mr. Whitworth has produced an arm of unparalleled merit, and we are gratified with this measure of success; but before we can lend ourselves to any attempt to force its adoption upon the Government, we must learn much respecting it of which we are yet ignorant. We must be informed of the amount of time, and care, and labour spent upon its construction; at what cost it has been produced; and at what expense, and with what degree of accuracy similar arms can be constructed in numbers sufficiently great to supply our armies. No one doubted that Mr. Whitworth could produce *an arm* which would beat the ordinary army rifles, made in abundance at Enfield. This alone is a result which we should not have required the aid of Mr. Whitworth to accomplish; Mr. Lancaster could have effected it with perfect ease, without the assistance of professional mechanicians. Nor, indeed, should we even have required to seek the unrivalled skill of that experienced gun-maker for the purpose; a far inferior man would have done it for us. Even the *Times* itself has since seen, to a limited extent, the need of further information, which we are now expressing; and in a leading article of Monday last, says, "It does not follow that the best rifle for shooting quietly at a mark will be the best for the service of an army. The weapon thus far superior may be so apt to get out of order, so difficult to repair, so hard to load, or so generally ill-calculated for rough and rapid use, as to be inferior on the whole. Even weight has much to do with the question." But we are compelled to go further than this, and to state that until we learn the cost of the Whitworth rifle (and its projectiles), the degree of facility with which it may be produced, and very many other facts connected with it, we must suspend our judgment upon the real progress made by Mr. Whitworth in this matter. If the advance should prove real and great, no one will be more gratified by the result than ourselves.

We do not think it desirable to dwell upon the somewhat ridiculous statements contained in the article before us. It will be sufficient to say that the writer mentions "rapid pitch" of the bore, as a circumstance which helps to render stripping of the bullet impossible, when that is, of course, the usual cause of stripping; that he also considers less rapid wear to be a characteristic of the new rifle, when its "rapid pitch" (two turns in its length) will unquestionably occasion enormous wear and

tear; and finally, that he says, "some idea may be formed of the extraordinary power of his (Whitworth's) arm, when we mention that his projectiles in their flight rotate at the rate of 15,000 revolutions per minute!" —a curious indication of the power of a fire-arm certainly, as any one may see who remembers that rotation can only be obtained at the expense of projectile power.

Mr. Whitworth proposed the polygonal form of bore in the first place for cannon, we believe, but it passes our comprehension to understand how such a form can be consistent with anything like maximum strength and minimum lightness, both of which are, of course, desirable. It is well known that internal angles, which give what is called "lead" to the explosive action of the gunpowder, conduce most seriously to the bursting of the gun; and it seems to us impossible for this tendency to be overcome, without resorting to the use of extraordinary mass and weight of metal.

But whatever may be the merits or demerits of the polygonal form of bore, it is not new, and it is not Mr. Whitworth's, for Mr. Brunel had a gun made with a similar bore, by Mr. Westley Richards, several years since. It is true that Mr. Whitworth proposes to form the gun in a number of longitudinal pieces or sections; but this cannot, of course, apply to small arms, and is an extremely questionable proceeding with ordnance, on account of the great weight which attends the method.

We are anxious that Mr. Whitworth should have his just share of credit in this matter, but it is grossly unjust to other gentlemen to place him, as the *Times* reporter places him, alone on an eminence, as the great improver of our military weapons. There are many who have laboured hard, and long, and with great success in improving our knowledge of the principles and practice of arm-manufacture. Of the labours of Mr. Lancaster, in particular, we would speak with the utmost confidence, as far more calculated to excite public gratitude, and call for public recompense, than anything that Mr. Whitworth has yet been able to accomplish.

We write thus freely upon this subject because we shall not be suspected of having the smallest ill-feeling towards so able a mechanician as Mr. Whitworth, and because his fame is so great, and justly so, that he can well afford to have his claims confined to legitimate limits.

We purpose giving some additional particulars in our next.

BLACKBURN MECHANICS' INSTITUTION SOIRÉE.

SIR ROBERT PEEL ON PRACTICAL SCIENCE.

On Thursday evening, April 23rd, a grand soirée was held in connection with the Blackburn Mechanics' Institution, in the Assembly-room, Town-hall. The following extract from Sir Robert Peel's speech is taken from the *Blackburn Weekly Times:*

After the reading of the Secretary's Report, Sir Robert rose and said,—Ladies and gentlemen, it is with very great gratification that I now rise as chairman on this occasion to continue the proceedings of this evening. As I stand here in this really magnificent edifice, which reflects so much credit upon the liberality of the town, and so much embellishes and adorns it, I cannot refrain from making a very serious and solemn reflection, and in making it I feel sure that it will meet with the sympathies of those who I have now the advantage to address. I cannot refrain from reflecting that the time was, when emerging from a back street in this town, my predecessors set an example of enterprise to the whole trade of this district. (Loud cheers.) And whilst on the one hand the acknowlegment of a grateful nation has done justice to the patriotism and enlightened policy of my father (loud cheers), on the other hand, the persevering industry and the successful enterprise of trade have, through another channel, irrevocably attached my name to this town and district. (Cheers.) This institution, which we are now celebrating, is called a Scientific Institution. We have just heard that there is what is called an engineering class. What a noble effort those men are making in the right direction. We find that they have not the opportunity for this study, and they unite together; and I hope there are some of the members of that class here, that they may receive from an humble individual some little word of encouragement. The plan they adopt is the way in which they may be confident that they will succeed in their exertions. We are told that it is from mechanical skill and scientific invention that the great progress of our country has resulted. Let me observe that the present age in which we live is eminently practical. We have now done away with all the fine theories of the school of Voltaire and Diderot. Science is everywhere: when we want to travel rapidly by locomotion, it is the steam that carries us; when we want to send our communications of thought, it is the electric telegraph that gives wings to our ideas. Then recollect that this study of the sciences is only in its infancy. All these great advantages which

we are reaping, are matters which have only just been developed to the world. How ought we to exclaim when we see these benefits thrown upon us? We may justly exclaim—"O God! how glorious are thy works, thy thoughts are very deep. An unwise man doth not well consider this, and a fool doth not understand it." (Applause.) Let us hope that this generation may know, as far as lies in their power, to understand and profit by these advantages, and we shall not fail to reap the manifold benefits of our knowledge. Science is present with us in every branch of industry. I was reading, the other day, your catalogue, which I hastily scanned, containing a list of the books and pamphlets in your institution, and I do not find one which *I think* you ought to possess—*The Mechanics' Magazine.* I think it is an admirable periodical, which should be in an institution which is designed for the welfare of the industrial classes, just to show you that science is entering into everything with which we are engaged.

COPYING INK FOR PRINTING.

Every one acquainted with commercial transactions must be aware that the practice of copying letters and documents is all but universal. By the ordinary process, the written portions of letters, &c., only can be copied in the copying press, while the printed portions, such as headings, addresses, blank forms, &c., are not transferred to the copy. This defect has recently been completely remedied by the introduction of an invention, patented by Messrs. Underwood and Burt, stationers and printers, of Fish-street-hill, London, which invention consists in manufacturing inks for printing in such a manner, that after having been impressed by printing upon the surface of paper or other material, such inks may become soluble, or partially soluble, by the application of moisture, and to such an extent that copies may be taken therefrom upon damp paper by the ordinary copying press. In order to effect this object, the patentees cause the ink to be made of colouring matters or pigments necessary to produce the intended colour, to which they add a material, or mixture of materials, requisite for causing the particles of the colouring matters to cohere, and to adhere to the surface upon which the ink is to be printed, and also a material, or mixture of materials, which will cause the ink, after being so printed, to be not only capable of drying when requisite, but also capable of being afterwards rendered sufficiently soft and soluble by moisture to yield impressions. Many materials or ingredients may be used. As an example may be taken the following description of the mode of making a black ink according to the invention. The patentees take of nutgalls, 14 lbs.; of sulphate of iron, 6 lbs.; of gum senegal, 12 lbs.; of treacle, 6 lbs.; of soap, 3 lbs.; of lamp black, 6 lbs.; of Prussian blue, 3 lbs.; and of filtered rain water, 15 gallons. The nutgalls are first bruised and then boiled for about three hours, more or less, in half the above-named quantity of water, and the clear liquid is drawn off. The gum and sulphate of iron are separately dissolved in the remaining quantity of water, and the whole is then mixed with the decoction of nut-galls, and exposed for about 21 days, more or less, to the atmosphere, when the supernatant liquid is drawn off from the deposited matters and sediment. The treacle and soap are now added to the liquid thus drawn off, and the whole evaporated in a water bath, to nearly the consistency of ordinary printing ink, and then the lamp-black and prussian blue are mixed with it. The above ingredients will form a black ink; but ink of other colours may be made by using a soluble colouring material or materials, such as sulphate of indigo, or carmine dissolved in ammonia, either separately or combined with colouring matter, such as is now employed in the manufacture of coloured printing inks, in lieu of the nut-galls, sulphate of iron, lamp-black, and prussian blue used in making ink as above described.

PATENT WOOL-COMBING MACHINERY.

COURT OF QUEEN'S BENCH, WESTMINSTER, APRIL 27, 1857.

Sittings in Banco, before Lord Campbell and Justices Wightman, Erle, and Crompton.

LISTER *v.* LEATHER.

This action has been repeatedly tried and reported in our pages.

Lord Campbell now delivered the judgment of the Court in favour of the plaintiffs, and in so doing entered at great length, and in a most elaborate manner, into the grounds of the judgment. His Lordship said that, for the reasons given, the Court thought the verdict had been properly found for the plaintiffs on all the issues, and that the rule for a new trial ought to be discharged.—Rule discharged.

HEARDER'S INDUCTION COIL.

The sensation produced in the scientific world by the introduction of Mr. Hearder's powerful modification of the induction coil, and the accounts which appeared of its extraordinary action in the early part of last year, have excited a desire in several scientific gentlemen to take up the subject; and we have heard of two coils of considerable power which appear to have been constructed upon Mr. Hearder's plan,—one by a young gentleman named Bentley (who is an amateur in science, and possessed of great ingenuity) which was exhibited in the latter part of last year by Dr. Noad; and another by Mr. Gassiott, which has been lately exhibited at the Royal Institution; and so far as they go, they appear to confirm the correctness of the principles which Mr. Hearder has laid down for their construction. It is but fair, however, to state, that although Mr. Hearder's labours have not, as far as we are aware, been alluded to in either of these cases; still, his peculiar mode of insulation and arrangement have, we believe, been strictly followed. Mr. Hearder is, we learn, preparing elaborate machinery for the construction of his instruments, so as to be able to supply them at a price which shall be accessible to all classes of experimentalists or telegraph companies who may require to adopt them.

THE PATENT LAW OF INDIA.

The *Calcutta Gazette*, of March 14, just received, contains the following announcement:

"The Honourable Court of Directors having informed the Governor General in Council that doubts are entertained as to the legality of Act No. VI. of 1856, entitled an Act for granting exclusive privileges to Inventors, and having directed the Government of India to refrain from granting patents, it is hereby notified for general information, that no further orders will for the present be made, authorising petitioners to file a specification of their inventions.

"By order of the Governor General of India."

This is, certainly a most untoward statement, and one which will justly give great offence to those persons who have already obtained patents under the Law of 1855. The only mitigating circumstance we have to notice is, that we learn from our Calcutta correspondent that the Indian Government intend to petition Her Majesty for her sanction of the law. The suspension has resulted from an intimation given to the Court of Directors by the Solicitor-General, to the effect that the law interfered with the Queen's prerogative, notwithstanding section xxxv. of the Act.

THE PROPULSION OF SHIPS BY ELEPHANTS.

A curious law-case was heard on Monday last, before Sir John Stuart, at the Vice Chancellor's Court. The plaintiff, a Mr. Moses, filed a bill for the specific performance of an agreement by the defendant, a Mr. Baylis, to assist the plaintiff in procuring and working a patent for propelling ships by means of horses and elephants; the *modus operandi* did not appear. After some legal fencing, the bill was dismissed without costs; it being assumed, in all probability, that the plaintiff had gained rather than lost by the failure of the defendant to fulfil his agreement!

THE CONSERVATION OF FORCE.

To the Editor of the Mechanics' Magazine.

Sir,—Professor Faraday's recent paper on this subject shows that, even in quarters where we would not expect it, there is anything but a clear conception of the principles or truths lying at the very foundation of mechanical science. It is something unusual to see the principal mechanical journals taking up the subject as has been done in this case, each editor by means of a special "leader," endeavouring in his own particular way to set the professor right. I think, however, with all due deference to the said editors, that there is still something more to be said on the subject; hence my present communication. In the leaders referred to, I find statements made which appear to me to be discordant. I can scarcely ask you, Sir, one of the said editors, to say which is right; but I do ask you to be kind enough to point out the error in the statement opposed to yours. It is, however, just possible that the two statements referred to are reconcilable with each other; in which case, I will thank you to point out in what manner, for I do not myself see it, and some others of your readers may be in the same predicament. The statements referred to are the following. At page 365 (April 18), you say, "By momentum our readers will understand that we mean the product of two quantities, one of which is *proportional* to the quantity of matter in a body, and the other is the velocity with which it is moving at a given instant of time; and our mechanical principle is, that, taking any fixed direction we please, and summing up the resolved parts of the whole momentum of every body or particle in this direction, this sum is constant." * * * "In this way we establish a strict conservation, not of force, but of momentum." Now, in a leader, page 291, April 10, the Editor of the *Engineer* maintains, that what is con-

served is "energy," and it is evident, that by this term he does not mean what you designate as "momentum;" for he says, "The energy of a body * * * is equal to the body's *mass* multiplied by one-half of the square of the velocity; the *mass* of the body being found by dividing its weight by the acceleration produced by that weight in a unit of time."

In other words, "The actual energy of a moving body is the product of its weigh. by the height from which it would have to fall in order to acquire its actual velocity;" and we know that the height varies as the *square* of the velocity. Further on the writer says, "The law of the conservation of energy is this, that the energy of the universe may be changed in form and distribution, but cannot be changed in amount. The potential energy of a body may be exchanged for an equal amount of actual energy, or *vice versâ*. This is called *transformation* of energy; or the energy of one body may be diminished, and that of another body may be increased by the same amount. This is called the *transfer* of energy," &c.

Now I cannot see how the amount of energy and momentum can *both* be invariable, as they must be if you are both right; but it will perhaps be better for me to suggest a case for consideration. Suppose a body of a given weight moves with a velocity of 64 feet in a given direction, and comes into contact with another body of the same weight (say 1 lb.) at rest, and that the two move on together after the stroke, no force or energy being supposed to be lost in the stroke; if the "momentum" theory is right, the velocity of the 2 lbs. should be just half that of the 1 lb. for

$$64\times1=32\times2.$$

But if the "energy" theory is right, the velocity of the 2 lbs. will be 32 feet $\times\sqrt{2}$; for to obtain the velocity of 64 feet the 1 lb. would have to fall through 64 feet; and to have the same energy, the 2 lbs. should have the velocity due to a fall through 32 feet.

I am, Sir, yours, &c.,
GOOSEQUILL.

Glasgow, April 24, 1857.

[The desire expressed by our correspondent "Goosequill" is so reasonable, that we shall do our best to gratify it. With the leader in the *Engineer*, we have no other acquaintance than that furnished by the quotation which appears in his letter. But from the statement made in that quotation, we must express our entire dissent. "Energy," as defined by the *Engineer*, is one half of the *vis viva* of a body, and is interchangeable with the amount of work which may be done on it to reduce it to rest. Now, "*vis viva*" has no reference whatever to direction, and is therefore incapable of being affected with different signs, as denoting contrariety of position; its amount is simply an arithmetical quantity representing the product of the mass, and the square of the velocity; it is greater or less as the velocity *per se* is greater or less, that is, without regard to direction. Suppose, now, two particles originally at rest attract each other, and move directly towards one another, the momentum generated in one particle is equal and opposite to the momentum generated in the other, and the sum of their momenta is consequently zero; in other words, the conservation of momentum applies. But as they continue to move towards each other, the velocity of each particle, without regard to sign, increases, and the *vis viva*, and consequently the energy, of each particle increases, and the sum of their energies, so far from being zero, is a constantly increasing quantity. But even if *vis viva* could be made to appear with a difference of sign; if the sum of the momenta is zero, which it undoubtedly is, the sum of the *vires vivæ* cannot be so; that is, it is impossible at once to have the simultaneous equations

$$\left.\begin{array}{l} Mv+M_1v_1=0 \\ Mv^2+M_1v_1{}^2=0 \end{array}\right\} \begin{array}{l}(1)\\(2)\end{array}$$

In fact M and M_1, from the nature of the case, are incapable of changing their signs. The only quantities variable in sign are v and v_1, and the squares of these quantities are positive, whether they themselves be positive or negative. Equation (2), therefore, is impossible, and yet, since the particles move from rest, if the principle of conservation of *vires vivæ* were correct, it ought to be possible. Suppose the same two bodies describing elliptic orbits round each other, the *vis viva* of each increases or diminishes, as the distance between the particles diminishes or increases, that is, they both increase and diminish together; hence,

the sum of their *vires vivæ* increases or diminishes, and cannot be constant. It is true that after a complete revolution, the *vis viva* of each, after undergoing certain changes, increasing during one part of the orbit, and diminishing during the other, comes back to its original value, and then a kind of periodical conservation of *vis viva* is established. But this is very different from the conservation which the *Engineer* asserts, and which is true with regard to momentum. If we enlarge our ideas from a system of two bodies to the universe, it may well be that when all the bodies in it come round again to occupy exactly the same position which they do now, the aggregate *vis viva* will be the same; but in the meantime, it will be subject to fluctuations. That period itself, too, who can assign?

To reduce the question to the test of the case which "Goosequill" proposes, there cannot be a doubt that it is the sum of the momenta of the bodies which is unaffected by the impact, and not the sum of the *vires vivæ*. The only action which takes place between the bodies is that which commences at the moment of impact and goes on (they being inelastic) until the velocity of one is reduced, and that of the other increased, so that they have at last the same velocity. The measure of this action is the whole momentum gained by the one and lost by the other.

If M and M_1 be the masses, v and v_1 the velocities before impact, V the common velocity after, and R the mutual action, that is, the momentum gained by one and lost by the other;

$$\text{Then } M V = M v + R$$

$$M_1 V = M_1 v_1 - R$$

$$\therefore (M + M_1) V = M v + M_1 v_1$$

$$\text{If } v_1 = 0, V = \frac{M v}{M + M_1}$$

$$\text{that is, if } M = M_1 = \frac{1 \text{ lb.}}{g} \text{ and } v = 64$$

$$V = \frac{64}{2} = 32$$

The equation $\frac{1}{2}(M+M_1)V^2 = \frac{1}{2} M v^2 + \frac{1}{2} M_1 v_1^2$ is incompatible with the former, and is erroneous.

Having done our best to satisfy "Goosequill," we will make one remark on the letter of Mr. Cheverton, which appeared in our last number. That gentleman uses the word "force" in such an exceedingly vague and indefinite sense, that it is impossible to argue with him. *Momentum* and *force* are essentially distinct ideas, as Newton established most incontestably; and nothing but vagueness and mischief can result from any attempt to include them in the same idea. Force is that which "alters" or "tends to alter" a body's state of rest or motion. Motion, and consequently momentum, may exist independently of the action of any force. Were the present constitution of matter changed so far as concerns the mutual attraction of all bodies, without altering the laws of inertia, every body in the universe would go on moving uniformly in a straight line with the velocity it had at the moment of the suspension of the law of gravitation; and although the bodies might and would separate to an infinite distance from each other, the sum of their momenta, measured in any given direction, would be always the same as it is at this moment.

The principle of "conservation of momentum," applies just as well to the case where the "molecular forces are in a dead lock," as when motion ensues. There is, as we have said, no momentum produced by *force*, without an equal and opposite momentum being produced; the momentum, then, which in one body is destroyed in the act of producing an equilibrium of pressure, is balanced by the opposite momentum, which is destroyed in the same act; and thus, on the whole, the conservation of momentum is provided for.

We see in Mr. Cheverton's letter the working of one of the most mischievous results of Professor Faraday's unfortunate lecture. It is sure to call out the gentlemen who think themselves strong in philosophy, though confessedly weak in mathematical science; and our ears will be dinned with the streams of unintelligible nonsense, which, under the guise of philosophy, will be let loose on us. The animus of Mr. Cheverton is pretty well indicated in the last paragraph of his letter. His object is to set up a distinction between mathematicians and philosophers, and he succeeds so well in his own imagination that he has gone near to establish not simply a "divergence," but an "incompatibility." The only conclusion the uninformed are likely to draw from this "philosophizing" is, that the writer of the letter is no mathematician, in which they will be fully justified.

It is true enough that every mathematician is not a philosopher; but it is simply absurd to suppose that a man can be a mechanical philosopher without a competent share of mathematical skill. A knowledge of language will not make a man an orator; but no man can be an orator without a competent knowledge of language. We do not deny to Faraday the possession of a philosophical mind, but we do deny his compe-

tence to deal with the principles of mechanical philosophy, not because he has any natural inaptitude—far from it; we believe that he would, under favourable circumstances, have been eminent as a mathematician; but because his education has not given him an acquaintance with the very A, B, C of the language of mechanical philosophy.

Faraday, however, has at least the merit of writing clearly and distinctly on the topics which he handles, even though they be out of his own domain. A farrago of high-sounding philosophic terms, and imaginary dialogues between imaginary Platonists and Aristotelians, (having, as far as we can discover, an imaginary point) in which Faraday is too profound a thinker to indulge, will do little towards bringing about the proposed divorce between philosophy and the language in which its ideas must be clothed. It cannot be too much enforced on our impatient friends who want to be philosophers without undergoing the labour of serving the regular apprenticeship that mathematical science bears to physical philosophy the same relation that the Greek language bears to the sublime and noble thoughts which are embodied in ancient Greek literature. One may understand the language without grasping the thoughts; but no one can appreciate, or take one step towards the bare understanding of the thoughts, without a competent knowledge of the language in which they are embodied.—Ed. M. M.]

To the Editor of the Mechanics' Magazine.

Sir,—In his letter which you published last week, Mr. Cheverton gives what he terms three aspects of the principle of the conservation of force. 1st. He tells us that the "indestructibility of matter is the conservative aspect of force, viewed simply in respect to its abstract entity or mere existence." 2nd. Force presents a conservative aspect "as an entity in concrete palpable existence, through a display of its energy in the production of effects." The 3rd. is a more modern aspect—an "*hypothesis* adhered to" by Faraday and others, in which it is supposed

"that matter, in virtue of a constant activity of force, can never be coerced into quiescence; that it can never be still; but that it is eternally modifying and being modified, ever changing from one form of manifestation into another; from heat, light, motion, electricity, or other phenomena into each other, and back again in ceaseless circles of mutation; and whilst displaying itself in any particular form, is ever active therein with that peculiar motion by which, through corresponding appropriate sensations, it makes itself known to us in distinct phenomenal modes of existence."

These great words, Sir, may possibly enclose great and undiscovered truths, but my unaccustomed faculties cannot detect them. Thoughts clothed in such stately garments, and decked in such imposing trappings, might well awe into acquiescence and subjugation a sturdier sceptic than myself. How can I deny, or controvert, or criticise statements and hypotheses which I do not understand? But, of course, I can go no farther in the direction of belief than to say, that perhaps he may be right; and I must delay my further judgment until I learn the dialect in which the letter is written, and which is as yet unknown to me, or until I am favoured with a translation.

The reading of the whole letter gives an impression much like that I remember experiencing when, visiting for the first time a country fair, I listened to the awe-inspiring hero of a caravan, as he proclaimed with gong and trumpet the wonders of his establishment. He was a mystery far removed above my comprehension. The brazen preface to his oration; his words loud, long, and numerous, swelling with impressive volume from the bell of his speaking trumpet; the wonderful and imposing paintings and emblems displayed to my admiring gaze, all tended to augment my awe towards the great magician and master of such a wonderful domain. But what a sequel to so much promise! Inside I found hardly anything to gratify—much to offend. Experiences like this I have frequently met with since, and they have made me distrustful of mere superficial display. I cannot help feeling my habitual distrust on examining Mr. Cheverton's literary and scientific exhibition. As yet, I cannot pass its portals, but am obliged to remain on the outside, and wonder whether in this case, too, there is the old disparity. Mr. Cheverton may have scientific truth imprisoned in the vehicle which his style and language form; but, if so, it is hidden, not revealed. I cannot say his words are not the dwelling place of truth; but if so, the dwelling is opaque, and the august inmate not discernible from the outside. I fancy, however, that through one or two chinks I catch occasional and fleeting glimpses of error. I am told that there is a distinction

"between the expression of the law of gravity in terms declaratory of it simply as a mathematical fact, and the same terms declaratory of it as the essential physical attribute of the force, independent of any conditions under which it may be exercised, and from which only, as a result, the mathematical fact may arise."

Then follows what seems to be intended for an elucidation of this distinction; but as the reader continues, he finds matters grow more unintelligible rather than more clear.

I do not profess to know anything about this pretended distinction; but if there be two ideas which are not mutually opposed, both of which, indeed, may be true, why attack one merely because it has entered some minds without taking the other with it? I have only the one, have not acquired the other, but will try to be very docile, if I can meet it face to face.

I do not know what is meant by a mathematical fact. To me, a fact is a fact, and one fact is as good as another, in a philosophic point of view. In philosophy, I believe in nothing but facts. In physical, mental, moral, social, and political philosophies, facts are all in all.

The appeal to facts is the inductive, and not the "high *à priori* road," as Mr. Cheverton seems to think.

The paragraph about the anti-mechanical, medieval, and Aristotelian philosopher, may have two interpretations. It may mean that an Aristotelian philosopher of the middle ages could not reasonably be termed a mechanic; or it may mean that I properly belong to that class of philosophers, and have falsely assumed the designation which I attach to my letters. If the latter be the true interpretation, Mr. Cheverton will permit me to say that he pays me a compliment entirely undeserved, in placing me in the ranks of any school of philosophy. I do not know enough of the system of Aristotle to renounce him. If I discover that I have been for years an unconscious Aristotelian philosopher, I shall be as much surprised as was Molière's Bourgeois Gentilhomme on learning that he had been all his life-time speaking prose without knowing it. I can only say that if Aristotle's method of treating natural science was like that which I have attempted to represent, I have not the slightest doubt that his method was the right one.

The tirade against mathematics arises, I should imagine, from envy of the power which they give to their possessors. From the fact that Mr. Cheverton directs most of his teachings against my letter, I may be led to believe that he places me also in that obnoxious class. I, however, disclaim all pretension to such an honour. I know too well my unworthiness to think of myself as a mathematician. The little knowledge of the subject which I have been able to acquire has induced me to regard with increasing respect the mental powers and the industry necessary to construct and to master the extant mathematical learning. In my opinion, the pursuits of the experimentalist are mere amusement when compared with the patient labours of the cultivator of mathematical science. Besides, the utility of this knowledge cannot be esteemed too highly. Sir John Herschel is no doubt right when, speaking of the Temple of Astronomy, he says:

> "Admission to its sanctuary and to the privileges and feelings of a votary is only to be gained by one means—a sound and sufficient knowledge of mathematics, the great instrument of all exact inquiry, without which no man can make such advances in this or any other of the higher departments of science, as can entitle him to form an independent opinion on any subject of discussion within their range."

Mr. Cheverton must know a great deal about mathematics to enable him to support an opinion adverse to Sir John Herschel.

As to the propriety of the "cognomen" I bear, let me entreat him not to rob me of that, as I have no other. If I be not a mechanic, I don't know what I am. Such a deprivation would "leave me poor indeed."

It is, in my opinion, a waste of energy to attack the common scientific faith without better weapons than any yet brought against it, or without presenting to common people a system which they must prefer. Till this is done, I shall still defer removing my confidence from the old to place it in anything new; still continue to look with doubt and suspicion on what is not yet proved, remembering, as Bacon says, a prevalent error is,

> "an impatience of doubting and a blind hurry of asserting without a mature suspension of judgment. For the two ways of contemplation are like the two ways of action so frequently mentioned by the ancients; the one plain and easy at first, but in the end impassable; the other rough and fatiguing in the entrance, but soon after fair and even; so in contemplation, if we begin with certainties, we shall end in doubts; but if we begin with doubts, and are patient in them, we shall end in certainties."

A dreamer may disapprove of my decision, but the *practical* man cannot fail to agree with me.

But, supposing this principle of the conservation of force be correct, will any non-mathematical philosopher be able to establish its truth? I think not. How can a man who has not made, and cannot make the calculation, decide whether the arithmetical sum of the various attractions on any heavenly body subject to the received law, is not always constant? How does he know that as the earth approaches the sun, and the force between them increases, it does not recede from the other heavenly bodies in such a way as to diminish their attraction by an equal amount? I recommend Mr. Cheverton to investigate this question without the aid of mathematics *if he can.*

It is plain to me that none but a mathematician knows anything of the foundation of the law of gravitation. None but a mathematician can determine whether it varies or not. If Mr. Cheverton is not a mathematician (as I presume he is not), I should like to know how he has learned that there is such a thing as a force of gravitation in existence, and how he has become acquainted with the law of its action? I wonder he condescends to receive information from those he affects so much to despise. I wonder he does not altogether deny the reality of discoveries which only a mathematician could possibly have made.

And now, Sir, I must conclude, with a hope that Mr. Cheverton will still permit me to subscribe myself,

Yours, &c.,
A MECHANIC.

To the Editor of the Mechanics' Magazine.

SIR,—I shall be glad if you will afford me space for an observation or two upon Mr. Cheverton's letter, which has so much annoyed me by its length and ponderosity, that I shall be but little disposed to be long myself. Mr. Cheverton says (page 395):—

> "The popular conception—may I not say the scientific idea—of the force of gravitation, is, that its decrease according to the square of the increasing distance is *per se* the nature of its action, through the influence of the distance alone—an opinion which Faraday very justly controverts."

I reply, that this "decrease according to the square, &c., &c.," *as expressed by Mr. Cheverton*, is neither a "popular conception" nor a "scientific idea." Mathematicians who have stated the scientific idea of gravitation (upon which the popular conception is founded) have been content to behold the world as it is—a system comprising numerous particles and numerous masses—and they have stated a law which has been found to regulate the forces which act upon and among these numerous particles and masses, and have not pronounced opinions upon "the *nature* of its action," nor speculated as to what law would be found to regulate the forces acting upon two particles or three particles, if they alone existed. I would ask with what reason does either Mr. Cheverton, or Professor Faraday himself, cast contempt upon a definition which mathematicians have put forth as illustrative of this universe of innumerable particles and unnumbered worlds, because they fancy it is inapplicable to their little, imaginary, Lilliputian universe of two or of three particles? The Professor imagines two particles, A and B, to exist absolutely alone. All things else are to vanish. He further imagines A and B to be danced (divinely) to and from each other, and then, with A and B in play before him, he turns to the mathematician, and says:—"Sir, If your idea of the law of gravitation be correct, we have here an alternate creation and destruction of force; for as A and B approach, the attraction between them increases, and as they recede, that attraction diminishes. Therefore, Sir, you are manifestly in error, and are bound to change both your views and your definitions."

I am a very humble mathematician, indeed; but even I should have no hesitation in rejoining;—"Illustrious Sir, Your pair of particles, so singularly circumstanced, form such an obvious contrast with the universe around me, that the laws of one can neither be verified nor invalidated by reference to the other—unless it be previously shown that the comparison is legitimately instituted, which in the present instance, is not the case."

The next two paragraphs of Mr. Cheverton's letter indicate a weak bias against mathematicians. I will shortly reply to them by saying that no one complains of Professor Faraday for seeking to discover the *modus operandi* of the force of gravitation (although I agree with "A Mechanic" in thinking the attempt vain); but what is complained of, I apprehend, is that, instead of proceeding at once with his search, he has fallen foul of mathematicians because the enunciation of the law put forth by them is not applicable to cases to which he has wished somewhat whimsically, as I have shown above, to apply it.

Those parts of Mr. Cheverton's letter in which "A Mechanic," who is said to write "in an excellent spirit," is replied to in a spirit far from excellent, will no doubt be attended to by that able gentleman; I will, therefore, refrain from mentioning them further. I will also pass over, without criticism, two paragraphs which terminate with this great and greatly-expressed "idea"—that the force of attraction "is a diffusible force, expanding as it progresses from its central existence in ever enlarging concentric spheres of potential operation," by which is meant, I presume, that force is carefully conserved by spreading incessantly away into immeasurable space, from which it never can by any chance return! If this is not meant, I shall be excused for not exactly knowing what is. The two long paragraphs which follow seem, however, to indicate that I have rightly understood Mr. Cheverton on this point. With regard to Mr. Cheverton's last paragraph (of the letter, for I shall omit to notice the elaborate P.S.), I will first say that if Mr. Cheverton

is a mathematician, which I, of course, doubt, he must be aware that Faraday has no right to discuss mathematical subjects without mathematical knowledge; and if Mr. Cheverton is not a mathematician, it is presumption, and almost charlatanry, in him to assert that it is noble in Faraday to contend for his right to discuss a subject which is, to a very great extent, at least, mathematical; for he (Mr. Cheverton) cannot possibly, in that case, know whether Faraday is competent or incompetent to discuss it.

I am, Sir, yours, &c.,

SPECTATOR.

ON THE AREA OF THE SCREW PROPELLER.

To the Editor of the Mechanics' Magazine.

SIR,—In the March Number of the *Journal of the Franklin Institute*, I observe an article headed, "A Simple Method of Finding the Helicoidal Surface of a Screw Propeller, and the Practical Development of such Surface upon a Plane. By James H. Warner, Eng. Corps. U.S.N." On examining this method, I am not surprised to find, that though it may properly be styled simple, its simplicity is not the simplicity of truth. Mr. Warner describes his method as "an adaptation of the centrobaric principle, or the 'Guldinus' properties of bodies." He then shows the application of the second property of Guldinus to the case of a circle, and immediately starts off by saying, "Applying this to the screw," &c., apparently untrammeled by any suspicion that this property of Guldinus does not belong to the screw at all.

The principle known as the second property of Guldinus asserts that when a plane curve generates a surface by revolving *about an axis in its own plane*, the area of that surface is equal to a parallelogram, whose base equals the length of the curve, and whose height equals the length of the path traced out by the centre of gravity of the curve while generating the surface. Now, Mr. Warner makes the mistake of supposing that the mode of generation of the common screw satisfies the above conditions; he therefore estimates the area of the screw blade by multiplying the length of the generatrix, that is, the radius by the length of the helix traced by its middle point—a mistake which indicates a want of exactness in Mr. Warner's geometrical knowledge. Of surfaces having straight generatrices, only cones and cylinders, and their compounds, satisfy the conditions of the second property of Guldinus.

It is quite clear to every geometer, that the generatrix of the screw does not revolve about an axis in the same plane with itself, because of the following pair of facts: 1st. The rate of motion of a point of the generatrix increases with its distance from the axis of the screw. 2nd. At no point is this rate zero, however far the generatrix be produced. Indeed, if the surface included between two consecutive positions of the generatrix be regarded as a surface of revolution, it must be as a part of an hyperboloid of revolution, and of one sheet, in which, as all geometers know, the axis of revolution is not in the same plane with the straight generatrix.

The correct expression for the area of the screw blade, is

$$\frac{rh}{2}\left\{\operatorname{cosec} A + \tan A \log_e\left(\cot\frac{A}{2}\right)\right\}$$

The erroneous one given by Mr. Warner, is

$$\frac{h}{p}\sqrt{p^2+\pi^2 r^2}$$

In these formulæ h=length of screw, p=pitch, r=radius, A=angle which helix makes with a plane at right angles to the axis. The latter expression has a very decided advantage in point of simplicity, but I think this cannot be considered an adequate compensation for its want of truth.

I am, Sir, yours, &c.,

A MECHANIC.

THE WHITWORTH AND ENFIELD RIFLES.

To the Editor of the Mechanics' Magazine.

SIR,—A statement appeared in the *Times* of the 23rd ult., purporting to give the result of a trial made at Hythe in order to test the merits of these two rifles, but so calculated to mislead the public, that I am induced to offer a few remarks upon it. In the first place, as related to the weapons themselves, Mr. Whitworth might have had Queen Anne's pocket piece rifled and fired against the Enfield musket for anything we could gather to the contrary from the article in question; for the writer (who, by the bye, appears wofully ignorant of the ordinary principles of the rifle) gave neither the comparative weights of the arms, the diameters of their bores, the weights and dimensions of the projectiles, nor the quantity and quality of the respective charges used with them; neither did he mention the date of their make, or whether either had been used before, or whether the bullets used with the Whitworth rifles for the trials of range and penetration were the same in both instances. He also neglected to state whether there was the same facility

in loading with both rifles, and whether the tendency to foul was greater in the one case than in the other. I have heard an account of this trial from a practical man (upon whose information I am much more disposed to rely than upon the one-sided statement that appeared in the *Times*), which places the matter in a very different light. It appears that the Whitworth rifle was quite new, and very beautifully finished as to the interior of the barrel, whilst the Enfield rifle was one that had been for some time in use, and indeed was so enlarged in the bore from constant use that the bullet scarcely required ramming home. The Whitworth bullet was three diameters in length, and of reduced diameter, being both rather heavier than that used with the Enfield musket, and also offering less surface to the opposition of the air from its reduced diameter. The powder used with the Enfield musket was the ordinary Government powder, whilst a stronger description was used for the other. Also the bullets used for the trial of range and precision of fire with the Whitworth rifle were different from those made use of to test the power of penetration. If these facts are correct, and I have no reason to doubt it, they might as well have tried a Lancaster gun against the Enfield rifle for any satisfactory result that might be obtained from it.

A single glance at the *Times'* report would show a practical man that some important facts had been omitted; for the elevation used with the Whitworth rifle was stated as less than that used for the Enfield, the reporter informing us at the same time that the turn of the grooves in the Whitworth rifle was one whole turn in twenty inches, or more than three times that of the Enfield musket. This was at once a convincing proof that either the bullet was heavier, or the velocity given to it greater, to make up for the force expended in giving the projectile this enormous velocity of rotation. By the way, the writer of the report in question, in speaking of the penetrating power of Whitworth's bullet, appears to think that the velocity of rotation is force acquired, whereas it is a proof of force expended. From all the facts which I can gather on the subject, I should say that, for a practically efficient weapon, the Whitworth rifle was far inferior to the Enfield; and, putting aside the difficulty of loading with a turn in twenty inches and a bullet fitting the grooves, the angular bore conduces to foulness, especially with a non-expanding shot; and this would always be a great objection. The most suitable comment upon the whole report would be best expressed by honest Burchell's "Fudge!"

I am, Sir, yours, &c., Δ.

IMPROVED SHIP AND SIGNAL LANTERNS.

To the Editor of the Mechanics' Magazine.

SIR,—Having recently taken out a patent for improvements in ship and signal lanterns, I beg your indulgence in permitting me, by means of your widely circulating journal, to make known briefly the principle on which they are constructed.

I am, Sir, yours, &c.,
J. WEIR D. BROWN,
Late Demonstrator of Anatomy, London Hospital, late Assistant Surgeon, R. N., late Surgeon, Osmanli Cavalry.

25, Wickham-terrace, Lewisham-road, New-cross, April 27, 1857.

DESCRIPTION OF THE LENSES USED.

The shape of each lens is square, presenting a flat surface posteriorly, whilst anteriorly, instead of being convex throughout its course, it is sloped or flattened off from the centre in four directions; viz., upwards, downwards, and laterally. Each lens has four sides or edges. By means of the upper and lower it is fixed in the framework of the lantern; and by the lateral or perpendicular edges, which are mitred off in such a way that any number of lenses may be placed side by side at any required angle, it is joined to its fellow without the use of metal work to fix them. The only part of the lens which is concentrating in its properties is the centre, the remaining surface being of a diffusing principle; consequently each lens possesses one concentrating and four diffusing points.

Having in as few words as possible described the nature of the lenses, I will proceed with the description of the lanterns themselves; and as an explanation of one will suffice for all, I shall select the true signal lantern, the mast-head and paddle-box lamps being a portion of it.

DESCRIPTION OF THE LAMPS.

The object of this lamp is to show light with the same brilliancy and power from all points, so that when hoisted from the mast, yard, or any other part of a vessel, the light can be seen from every point of the compass. To effect this important end the lamp is constructed out of six of the above described lenses, placed side by side by their mitred edges, so as to form a lamp of hexagonal shape, no interior or exterior framework being used; and the lamp therefore presents, when viewed internally, nothing but six flat surfaces of glass. Externally, if a line be carried round the centre of the lenses, it will be found to be circular in form, the line resting on the convexities of the lenses; and between the convexities will be seen a series of depres-

sions. The convexities are the true concentrating portion of the lenses, the depressions being the diffusing. One half of the depressions between each convexity is formed by one lens, therefore the diffusing lateral surface of one lens is immediately opposite that of the other; and thus, when the lamp is lit up, the rays of light from these surfaces cross and mix with each other, whilst that from the upper diffusing surface shoots upwards, that from the lower downwards, and that from the centre directly forwards; so that it is impossible, whatever position you may be in, to see light from this lamp less brilliant at one point than another. Three colours are used, red, white, and green (each lamp having its own separate colour), by means of which signals can be made by night the same as with flags by day; for instance, two red lamps, one suspended above the other, denote danger; three, one above the other, distress; red above, red below, green in the middle, some other signal, and so on; so that with three colours placed in different positions night signals can be made.

The mast-head and paddle-box lamps are constructed exactly on the same principle as the signal lantern; but as light is not required to be seen all round, but only straight ahead, and so many points on each bow, three lenses are used, the shape of each lamp being trigonal. In these lanterns, reflectors are used to fill the space occupied by the three other lenses.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

THOMAS, G. C. *An improved method of making steel.* (A communication.) Dated Sept. 3, 1856. (No. 2039.)

This consists in using and adding a composition of chloride of sodium, prussiate of potash, and bichromate of potash, to molten or heated iron. By its action the particles of the iron condense, and thus the metal, in some cases, may be partially, but in others is wholly converted into steel.

LAMB, J. *Certain improvements in machinery or apparatus for preparing, slubbing, and roving cotton and other fibrous substances.* Dated Sept. 3, 1856. (No. 2040.)

This relates to centrifugal presser flyers, and consists in suspending or mounting the presser with its upright rod upon the hollow flyer leg, in such a manner that the centre of suspension or motion of the presser shall be concentric with the centre of the flyer leg. A second improvement consists in placing a small pin or stud inside the flyer leg, to prevent the presser rising up the flyer leg, and to limit the extent of its horizontal action.

JOBARD, J. B. M. *Improvements in the manufacture of lamps.* Dated Sept. 3, 1856. (No. 2041.)

In the improved lamps the oil is contained in a vessel of glass, and the flame is supplied with a current of air which descends along the sides of the vessel and ascends through the centre thereof. The other arrangements require engravings to illustrate them.

CORNIDES, L. *A new method of dressing or preparing hides, skins, intestines, and such like animal substances.* Dated Sept. 3, 1856. (No. 2044.)

This relates to the use (for the purpose of altering the natural properties of gelatinous or glutinous compounds contained in the above substances) of glicane and solutions of acetate of alumina, or salts of alumina, by the use of which he softens the gelatine or gluten.

GHIDIGLIA, S., and L. TURLETTI. *An improved buckle.* Dated Sept. 3, 1856. (No. 2045.)

This buckle requires illustrating with engravings.

SPILLER, E. P. *Improvements in the construction of chamber lamps.* Dated Sept. 3, 1856. (No. 2046.)

The patentee describes a cheap lamp, suitable for burning in place of night lights or mortars, and capable of being moved about without the risk of the oil being spilt.

MOZARD, J. *Improvements in the construction of miners' lamps.* Dated Sept. 3, 1856. (No. 2048.)

The upper parts of the improved miners' lamp are screwed on to the oil vessel, in such manner that the parts cannot be unscrewed without acting on the wick of the lamp, and drawing it into the wick tube so as to extinguish the flame; hence a man using such a lamp cannot obtain a light by opening the lamp. To prevent the flame being blown or drawn through the wire gauze a chimney is used, which ascends to such a height as to prevent the flame being acted on. The wire gauze is closed at top and bottom, except where the chimney passes into it. Above the upper part of the oil vessel, and below the wire gauze, the flame is protected by a cylinder of thick glass. The wick is snuffed by the ordinary bent wire.

PICKEN, J. *Improvements in the arrangement of the feed apparatus of machines for thrashing or separating grain.* Dated Sept. 4, 1856. (No. 2049.)

In the machinery to which this invention is applicable the grain is fed in between two rollers, and passes thence between the thrashing drum and a riddle, sieve, or grating extending round a portion of the drum at a slight distance from its surface.

This riddle, sieve, or grating is, according to the present invention, hinged at its inner end, or at the end farthest from the feed rollers, whilst its other end is so connected to the lower feed roller that it and the lower feed roller descend together when the feed is increased in thickness into the machine within a given time, the front end of the riddle or grating and the lower feed roller being supported by springs which yield.

MORRISON, J., and S. AMPHLET. *A new or improved fastening for belts, bands, and other such like articles.* Dated Sept. 4, 1856. (No. 2051.)

In this fastening two plates or bars are so engaged together by pins in the one engaging in slots in the other, that when moved over one another in one direction the plates or bars approach to, and grasp the loose end of the band or fastening between them.

DUMERY, C. J. *Improvements in steam engines.* Dated Sept. 4, 1856. (No. 2052.)

The patenteee proposes—1. To generate aqueous steam. 2. To render the same anhydrous by means of special apparatus. 3. To surcharge with heat the volume of steam only that is required for each stroke of the piston.

HART, J. T. *Improvements in apparatus for modelling statuary from life, and for measuring and copying statuary and other uneven surfaces.* Dated Sept. 4, 1856. (No. 2053.)

The object here is to assist the artist in obtaining a large number of measurements from statues and groups in galleries, from the human figure, &c., and in transferring them to marble in the absence of the model. The invention consists principally in combining upon bars or rails of various forms numerous receptacles for holding instruments with pointed terminations termed needles, &c.

LEIGH, E. and G. P. *Improvements in parts of machinery or apparatus used in preparing and spinning cotton and other fibrous substances.* Dated Sept. 4, 1856. (No. 2054.)

This consists—1. Of an arrangement of the top rollers used for drawing cotton, &c. Instead of allowing these rollers to turn upon pivots at their ends, the patentees make them hollow, and allow them to revolve freely on a dead or fixed spindle, the roller being kept in place by a clip ring fitting a circular groove on the spindle. 2. In a flyer, in which the boss has curved, zigzag, or spiral projections made to fit corresponding indentations at the upper part or shoulder of the spindle, the effect of which is to draw down the flyer firmly on the top or taper end of the spindle as it revolves, locking on the flyer, and preventing either vibration or flying off.

LEWIS, G. A. *Disconnecting and raising screw propellers.* Dated Sept. 4, 1856. (No. 2055.)

A frame or lift slides vertically between the stern and rudder posts. The upper extremity of it terminates in a shank which passes up through the after deck. To this shank is jointed a screw passing through a nut fixed above the deck, which nut, being made to revolve by toothed gearing, will raise or lower the screw, and with it the lift. When the lifting screw is not in use, the joint enables it to be turned down upon the deck; or it may be removed.

ROY, E. A., J. A. HALL, and W. T. BINNS. *An improved means of insuring draught in smoke-flues or chimneys.* Dated Sept. 4, 1856. (No. 2056.)

A fan like a screw propeller is caused to revolve in the flue or chimney, so as to propel the air or gases therein in the required direction.

KEATES, W. *Improvements in the process of reducing copper to the metallic state from ores and other materials containing copper, and in the furnaces employed therein.* Dated Sept. 4, 1856. (No. 2057.)

The patentee propels currents of air either upon the surface of the melted regulus or matt of copper, or through the melted regulus for desulphurising the same. Where the heat would render iron pipes inapplicable, he uses pipes made of fire brick or clay, &c.

ANDERSON, G. *Improvements in the combustion of tar and other similar matters, in heating gas retorts, and in the consumption of smoke arising therefrom, and from other fuels used therewith.* Dated Sept. 4, 1856. (No. 2058.)

The patentee allows the tar, &c., to trickle down an inclined heated plate which forms the furnace of a retort-heating chamber. The greater part of these matters are converted into gas during the passage over the heated plate. The residue falls in the form of breeze into the ashpit, which is kept nearly full. An air passage is maintained over this red-hot breeze. The indraught of air thus becomes heated, and passes up the space at the back end of the inclined plate, and there mixes with the gases evolved. He employs another retort chamber and furnace of the ordinary kind, heated by the combustion of coke. From this chamber he conveys the unconsumed gases and surplus heat into a third placed between the other two, into which also the unconsumed products from the tar furnace are conveyed. The combination of the gases from the two furnaces produces further combustion in the third furnace, whereby the smoke, &c., is said to be consumed.

HAYES, J. M. *An improvement in the*

construction of cartridges for fire-arms. Dated Sept. 4, 1856. (No. 2059.)

This consists in rendering cartridges impervious to damp, and dispensing with the necessity of tearing away a portion of the case previous to inserting the charge. The substance used for forming the cartridge is the skin or membrane which covers the gut of most animals. It is drawn while damp upon a block, and afterwards stuffed, connected to the bullet, &c.

MOBERLY, W. *Improvements in the grinding and polishing of curved and rounded surfaces.* (Partly a communication.) Dated Sept. 4, 1856. (No. 2060.)

In grinding or polishing cylinders, the patentee mounts the material to be worked on centres carried by a swivel frame connected to a fixed frame or cross head. Below the material, he places a circular table or disc on a vertical shaft. This table and the swivel frame are mounted eccentrically with regard to each other, and the material is so adjusted in its frame that, as the table rotates, it will give, by friction of contact, rotary motion to the material carried by the swivel frame.

TABBERNER, J. L. *Certain improvements in smelting ores.* Dated Sept. 4, 1856. (No. 2061.)

The principal feature here consists in directing the blast to the body of the furnace as well as to the hearth for fusing or smelting the entire mass of ore simultaneously or nearly so. The object is to dispense with large furnaces, and to use in lieu thereof several small furnaces, and to cause these to discharge their contents at short intervals into one large reservoir, from which the molten metal may be drawn for casting from.

ALDBOROUGH, Earl of. *Improvements in aërial navigation, and in the apparatus connected therewith, parts of which are applicable to locomotion generally.* Dated Sept. 4, 1856. (No. 2062.)

The general principles of the construction and navigation of the improved aërial machines are similar to those described in previous specifications of the Earl of Aldborough, dated respectively 30th January, 1854, and 20th March, 1855; and this invention also consists in the application of the present improvements or of modifications thereof, or of part or parts thereof, to locomotion generally. The invention cannot be described without elaborate engravings.

BROOMAN, R. A. *Improvements in the construction of buildings and parts of buildings.* (A communication.) Dated Sept. 4, 1856. (No. 2063.)

The parts of buildings are made in pieces, and may be easily set up, taken down, &c.

DANCER, J. B. *Improvements in photographic cameras, and in the apparatus connected therewith.* Dated Sept. 5, 1856. (No. 2064.)

These refer, 1. To binocular stereoscopic cameras, and consist in the use of a rack or chain movement in the centre thereof, for adjusting the focus. 2. To cameras in general, and consist in applying a fixed or permanent level. 3. To the use of revolving or sliding diaphragms or plates, pierced with apertures of various areas, which may, at pleasure, be brought into use. 4. To a method of altering the level of the lenses of binocular cameras. Another part refers to apparatus to enable the artist to expose successively a number of prepared plates, by arrangements of mechanism in the camera, without a dark chamber.

MONCKTON, H. E. C., and W. CLARK. *Improvements in machinery or apparatus for tilling or cultivating the soil.* Dated Sept. 5, 1856. (No. 2065.)

This relates, 1. To a rotary tilling instrument, for cutting up and inverting the soil, which has a longitudinal motion imparted to it in the direction of its axis simultaneously with its motion of rotation. 2. To an apparatus which operates by means of a kind of digging motion; it consists of successive rows of spade-like diggers at different heights, put in motion by means of cranks or other suitable means.

JOHNSON, J. *Improvements in railway carriages.* Dated Sept. 5, 1856. (No. 2066.)

This comprises ten improvements for signalling on railways, and for warming the carriages, locking the doors, stopping the carriages, &c.

MITCHELL, W. S., and C. M. E. GARTNER. *Improvements in the construction of watches.* Dated Sept. 5, 1856. (No. 2068.)

The objects here are—1. To admit of watches constructed with a going fuzee being wound up at the pendant without the use of a key, and also of the hands being set without opening the watch. 2. To admit of the nice adjustment of the regulators of watches.

REEDER, R. *An improved universal dial and chronometer compass.* Dated Sept. 5, 1856. (No. 2069.)

This compass cannot be described without engravings.

WILSON, R. *Improvements in valves and in apparatus connected therewith.* Dated Sept. 5, 1856. (No. 2070.)

This relates to so constructing valves that they may not be subjected to unbalanced pressure at any point of their stroke, and to a mode of working the slide valves of steam engines.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

LEVICK, F., jun. *Improvements in the construction and working of blast-furnaces for the smelting or making of iron.* Dated Sept. 1, 1856. (No. 2032.)

The inventor enlarges the furnace so as to increase its internal capacity; and the hearth he forms of such a figure as will admit of the insertion of a greater number of tuyeres than has heretofore been employed. These he sets radially around the hearth, and he also shapes the hearth so as to increase the surface of the fused metal to the greatest available extent. The tuyeres he arranges in two tiers, the lower to inject air into the fluid metal, while the upper are employed for the smelting operation, proceeding at a higher level. He also proposes to supply air at a much higher pressure than heretofore, and in some cases to use two different pressures for the two tiers of tuyeres.

ARON, M. *An improved leaven.* Dated Sept. 2, 1856. (No. 2034.)

This consists of a dried yeast or leaven, termed "sweet pressed yeast," composed of flour of sprouted barley or malt, flour of white beans or peas, potato flour,—of each about 86 lbs. To these are added gelatine and water.

ARCHER, A. *Improvements in the manufacture or preparing for use "founders' charcoal blacking," "coal dust," "loam," and "facing sand."* Dated Sept. 2, 1856. (No. 2035.)

This consists in the use of mill-stones, and a dressing cylinder or cylinders, like those used for grinding and dressing wheat, in the grinding and sifting of charcoal, coal, loam, and facing sand, for the use of foundries.

BATE, J. *Improvements in folios, clips, or files for holding letters, invoices, and other documents.* Dated Sept. 2, 1856. (No. 2036.)

The inventor constructs a form of folio or letter clip with an alphabetical register, to facilitate reference to documents.

HALLEN, S. and E. *Improvements in rolling metallic substances.* Dated Sept. 3, 1856. (No. 2042.)

Sets of rollers for rolling out bars are made with grooves therein to suit the forms required; the sets of rollers are horizontal and vertical alternately, the one set following the other, the faces of each set being at right angles to the faces of the preceding set, so that the fins made by the edges of the rollers shall come into the middle of the grooves of the succeeding set, and thus prevent the necessity of reversing the bar.

METCALF, J. *Improvements in the manufacture and treatment of tar-oil for dissolving India-rubber, gutta percha, gums, and gum-resins; and also in deodorizing all fabrics, wood, or any article impregnated with tar-oil or the products from coal-tar.* Dated Sept. 3, 1856. (No. 2043.)

The inventor manufactures chloride of tar-oil from the dead oil, crude oil, creosote, or heavy oil of tar obtained from coal-tar by distillation; and he so purifies, rectifies, and re-distils the said tar-oil as to render it fit, and equal to naphtha, for dissolving India-rubber, gutta percha, gums, and gum-resins, &c.

ROBERTS, J. *An improvement in the stoppering or closing of jars, bottles, and other vessels; applicable also to the joining of earthenware and other pipes.* Dated Sept. 3, 1856. (No. 2047.)

The inventor surrounds with a band of cork or India-rubber, &c., the lip of the vessel to be closed, and into this he causes the thread of a screw to take, and thus obtains a tight joint.

BISHTON, W. *An improvement or improvements in boats for inland navigation.* Dated Sept. 4, 1856. (No. 2050.)

In the improved boats the paddle-wheels occupy a position at the stern of the boat. A rail or fence is placed around the paddle-wheel at the end of the boat.

DUCHATEAU, A. E. *Improvements in stamp presses, and stamps used therewith.* Dated Sept. 5, 1856. (No. 2067.)

1. Presses are so made that the stamp containing the figures or letters is inked by the elevation of the lever of the press by means of an inking roller caused to pass under the stamp. 2. The stamp is made in such manner that the figures or letters therein can be altered by a self-acting motion, or at will, at every inking of the stamp.

BURSTALL, T. *Certain improved machinery for manufacturing bricks and tiles from clay alone, or mixed with other materials.* Dated Sept. 5, 1856. (No. 2071.)

This relates to a patent of the applicant's dated 1st Dec. 1851, and consists in manufacturing bricks and tiles from disintegrated clay, by the use of an elastic pressure on one side of the brick or tile, and the simultaneous pressure on the other side of a crank or lever driven by machinery.

HELRIGEL, C. L. F. *Improvements in lithographic printing-presses.* Dated Sept. 5, 1856. (No. 2073.)

In carrying out this invention the bed or table on which the stone is placed slides on a suitable frame. Motion is communicated to it by a toothed rack. The invention comprises several other arrangements.

DYER, H. and G. *Improvements in freeing textile fabrics, cotton waste, and fibrous matters from oily and other impurities.* Dated Sept. 6, 1856. (No. 2074.)

This consists in employing certain chemical preparations in a liquid state for cleaning the materials, and in adapting mechanical arrangements for preparing and finishing the materials so operated upon.

JUKES, J. *Improvements in stoves and fire-places.* Dated Sept. 6, 1856. (No. 2077.)

That portion of a stove (or fire-place) in which the fuel is contained is arranged to turn on an axis at the back, and has a set of fire-bars in front. When the fire requires fresh fuel it is put in through the doorway which for the time is uppermost; the door is then closed, and the stove is turned half way round on its axis at the back, by which the fresh coal will come below the ignited fuel.

HARDING, G. P. *Improvements in the manufacture of hats and other coverings for the head, and parts thereof.* Dated Sept. 6, 1856. (No. 2078.)

This consists in manufacturing hats, &c., by blocking the cloth or velvet into any desired form, and then cementing it on to a shape of corresponding form.

WRIGHT, P. *An improvement in the manufacture of anvils.* Dated Sept. 6, 1856. (No. 2079.)

The inventor proposes to run malleable iron produced by Bessemer's process into moulds or dies, and thus to obtain the basic form of the anvil. This may then be put under the hammer, and then have its face and beak steeled as usual.

PROVISIONAL PROTECTIONS.

Dated January 17, 1857.

139. Charles Fréderic Vasserot, of Essex-street, Strand, mechanical draughtsman. An improved paint. A communication from L. Kaercher and F. Perrin, of Marseilles.

Dated January 27, 1857.

234. Charles Townsend Hook, of Snodland, Kent, paper manufacturer. Improvements in the manufacture of paper. A communication.

Dated March 17, 1857.

747. Sir Francis Charles Knowles, of Lovell-hill, Berks, baronet. Improvements in the manufacture of cast steel.

Dated March 21, 1857.

790. William Seaton, of Chester-place, Regent's-park, gentleman. Improvements in the construction of the permanent way of railways, and in the machinery or apparatus employed therein.

791. William Moxon, of Bluepits, Lancaster, engineer, John Clayton, of the same place, carpet manager, and Samuel Fearnley, of Halifax, York, overlooker. Certain improvements in looms for weaving, which said improvements are particularly applicable to looms for weaving carpets and other looped or piled fabrics.

792. Thomas Lawrence, of Salford, Lancaster, engineer. Certain improvements in steam engines.

794. Henry Lafone, of Liverpool, tanner. Improvements in tanning.

796. Samuel Hemming, of Bow, Middlesex, manufacturer. A new or improved material for roofing or other building purposes.

798. Gustav Julius Gunther, of John-street, London, gentleman. Improvements in preparing blocks and stones for building purposes.

800. Matthew Augustus Crooker, of New York, U. S., engineer. Improvements in paddle-wheels.

802. Robert Mushet, of Coleford, Gloucester, metallurgist. Improvements in the manufacture of cast steel.

806. Edmund Hyde, of Kingston-upon-Thames, Surrey, gentleman. Improvements in the manufacture of fabrics from products of the husks of cocoa nuts.

Dated March 23, 1857.

808. Louis A. Normandy, jun., of Judd-street, Brunswick-square, London. An improved process for manufacturing iron. A communication from L. D'Aubréville, of Paris.

810. Thomas Nuttall, of Farnworth, near Manchester, spindle manufacturer. An improvement or improvements in machinery for preparing cotton, flax, wool, or other fibrous materials.

812. Ellis Rowland, of Manchester, engineer. Certain improvements in steam engines.

814. John Smith, of Albion-square, South side, Dalston, Middlesex. An improvement in applying steam or other aëriform fluids expansively in engines.

816. Jean Joseph Baranowski, of Paris, gentleman. An improved method of, and apparatuses for, signalling upon railways.

818. Marius Chastagnon, of the Pousin Ardèche, France. Improvements in tuyeres for blast furnaces.

Dated March 24, 1857.

820. James Tangye and Joseph Tangye, of Birmingham, engineers. A new or improved lifting jack.

822. Thomas Young Hall, of Newcastle-upon-Tyne, coal owner. Improvements in steam gauges and water indicators.

824. Samuel Fox, of Deepcar, Sheffield, improvements in hardening and tempering steel wire, and in straightening wire.

Dated March 25, 1857.

826. Charles François Léopold Oudry, of Auteuil, near Paris, electro metallurgist. Improvements in the preservation of articles of cast, wrought, rolled, and forged iron, zinc, and other metals or alloys of metals against oxidation from humidity and other destructive effects of air and water.

828. Thomas Lawes, of Chancery-lane, Middlesex. A machine or apparatus to be used in cleansing, purifying, and drying animal and vegetable substances.

832. Pearson Hill, of Hampstead, Middlesex. Improvements in machinery for stamping, marking, or printing and arranging papers, letters, and other articles.

834. Reuben Sims, of Bedford, near Leigh, Lancaster, agricultural implement maker. Improvements in machinery or apparatus for cutting hay, straw, and other similar substances.

836. John Henderson, of Lasswade, N. B., gentleman. Improvements in the manufacture or production of plain and figured fabrics.

838. Robert Cassels, of Glasgow, iron manufacturer, and Thomas Morton, of Motherwell, N. B., manager. Improvements in the manufacture of iron.

840. Simon Martin Allaire, of Paris, manufacturer. Improvements in manufacturing hats, caps, and bonnets.

Dated March 26, 1857.

842. John Radcliffe, overlooker, James Fearnehough, weaver, and Joseph Mather, joiner, all of Eccles, Lancaster. Certain improvements in index machines applicable to looms for weaving.

844. Charles Henry Baker, of Angel-court, London, gentleman. Railways passengers' signal alarum.

846. George White, of Laurence Pountney-lane, Cannon-street, London. Improvements in glass furnaces. A communication.

848. Jean Jaques Constant Benoist, of Rue Jerusalem, Brussels. A new method of applying marks on paper for postal purposes.

850. Josiah Latimer Clark, of Adelaide-road, Haverstock-hill. Improvements in lighting coal mines.

852. James Morris, of Albert-square, Clapham-road, gentleman. Certain improvements in connecting the rails of railways.

854. François Rualem, of Rue de Paris, Belleville, France, milkman. Improvements in railway breaks. A communication.

Dated March 27, 1857.

856. Alexander Delon, of Rue de l'Echiquier, Paris, gentleman. An improved mould for the manufacture of buttons.

857. Edouard Hochstetter, of Paris, gentleman. The employment for motive purposes of sulphuret of carbon, an agent not hitherto so used. Partly a communication from A. Seyferth, of Langensalza, Prussia.

858. Edmund Alexander Spurr, of Newton-road, Bayswater, architect. Improvements in fire-places, chimnies, and stove grates.

862. John Ward, of Glasgow, manufacturing chemist. Improvements in the manufacture or production of manures or fertilizing agents.

Dated March 28, 1857.

864. David Thomson, of Pimlico, engineer. Improvements in rotary pumps.

866. Ferdinand Jossa, of St. Helen's Colliery, near Bishops Auckland, Durham. Improvements in furnaces and ovens for the prevention of smoke and for economy of fuel.

868. Robert Russel, of Manchester, engineer. Improvements in railway turntables.

870. Louis Etienne Deplanque, of Rue de l'Echiquier, Paris. An improved composition for sharpening and setting fine edged cutting instruments.

872. Joseph Thursfield, of Congleton, Chester, plumber and glazier. An improved water-ram for raising water.

Dated March 30, 1857.

876. Joseph Scott, of Glasgow, glass manufacturer. Improvements in bottles, and their stoppering or closing details.

878. James Janson Cudworth, of Ashford, Kent, engineer. Improvements in locomotive boiler furnaces.

880. Richard Handley Thomas, of Kidsgrove, Stafford, machinist. Improved machinery for converting plastic substances into spherical forms or balls.

Dated April 7, 1857.

969. William Neville, of Jersey, doctor of medicine. Improvements in amalgamating certain substances for the production of fuel.

971. John Rothwell, of Enfield, Middlesex, and Samuel Dixon Cooper, of Westminster. Improvements in breech-loading fire arms.

973. John Talbot Pitman, of Gracechurch-street, London. Improvements in apparatus called fire-escapes. A communication.

975. Henry Dearden, of Rochdale, overlooker. Certain improvements in power looms for weaving.

977. Edward Finch, of Bridge Works, Chepstow. An improvement in railway breaks.

979. William Sullivan Gale, of New York, U. S. Improved means for rendering the joints of engines or other machinery steam or fluid tight.

981. Frederick Piercy, of Belgrave-street, Argyle-square, artist, and Samuel Flagg, of the same place, architect. A portable expanding life and military boat, which is also adapted for other purposes.

Dated April 8, 1857.

985. Benjamin Hingley and Samuel Hingley, of Cradley, Worcester, manufacturers. Improvements in anchors.

987. James Bird Sparke and Alfred Sparke, of the Thorn-lane Foundry, Norwich, engineers and ironfounders. Improvements in sawing machinery.

989. Edmund Edwards and Edward Beacher, of the Thorncliffe and Chapeltown Iron Works, near Sheffield. Improvements in machinery or apparatus for washing or cleansing mineral and other substances.

991. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improved machinery for cultivating land. A communication.

993. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improved machinery for manufacturing coiled springs. A communication.

995. Donald Bethune, of Cambridge-terrace, Hyde-park, esquire. Improvements in apparatus for preventing or consuming smoke in chimnies and furnaces.

Dated April 9, 1857.

997. John Harland, of Shield-street, Newcastle-upon-Tyne, timber merchant. Purifying plastic clay used for the making of all kinds of earthenware, and for the cheaper and more expeditious manufacture of bricks, tiles, draining pipes, and other articles of clay of a similar nature or description.

999. John Atherton Molineaux, engineer, of Brighton. Improvements in economising heat in locomotive and other high-pressure steam engines.

1001. Augustus Frederick Kynaston, of Plymouth, Post Captain in the Royal Navy. Securing and disconnecting ships' boats and towing cables.

1003. Edwin Powley Alexander, of Lincoln's-inn-fields, mechanical draughtsman. Improvements in the manufacture of fulminating powder. A communication.

1005. Joseph Purnell, of John-street West, Barnsbury, Middlesex, photographer. Improvements in apparatus for taking photographic pictures.

1007. William Clark, of Chancery-lane, engineer. An improved instrument for indicating the pressure of steam. A communication.

1009. William Armitage and Henry Lea, both of Farnley, near Leeds. Certain improvements in the manufacture of iron.

1011. John Beech, of Shrewsbury, engineer, and John Williams, of Wellington, Salop, inspector of railways. An improved mode of securing the rails of railways in their chairs.

1013. John Coope Haddan, of Cannon-row, Westminster, civil engineer. An improvement or improvements in the smelting and refining of iron. A communication.

Dated April 11, 1857.

1015. Charles J. Bunker, of New York, U. S. An improved life preserver, or life preserving shirt or sack.

1017. James Marrow, of Sheerness, Kent, engineer. Improvements in machinery or apparatus for manufacturing bolts, rivets, nuts, and other similar forgings.

1019. John Matthews, of Hurcott Mill, near Kidderminster, paper maker. A new or improved vat, to be used in the manufacture of paper.

1021. Sebastien Didier Lheritier, doctor of physic, of Paris. Certain improvements in signals.

1023. Joseph England, of Beverley, York. Improvements in machinery for washing and wringing woven fabrics and similar articles.

1025. François Desir Lejard, of Paris, gentleman. An improved safety apparatus to be applied to the triggers of fire-arms.

1027. Thomas Wilton, of Eastbourne, Sussex, gas engineer, and John Huggett, of the same place, engineer and smith. An apparatus for regulating the flow or supply of gas.

1029. Charles Sidney Johns, of Barnard's-inn, Holborn. Improvements in preparing pulp for the manufacture of paper.

1031. Josiah Gimson, of Leicester, engineer. Improved apparatus for preventing the explosion of steam boilers.

Dated April 13, 1857.

1033. Jean Baptiste Pascal, of Lyons, France, civil engineer. Improvements in electric lamps.

1035. Joseph Maurice, of Regent-street, dentist. Certain improvements in the fastenings, fixings, and attachments used for supporting or securing artificial teeth in the mouth.

1037. Joseph and Edmund Ratcliff, chandelier manufacturers, of St. Paul's-square, Birmingham. An improved mode or modes of adjusting chandeliers.

1039. William Edward Newton, of Chancery-lane, civil engineer. Improvements in the construction of boats, buoys, floats, or other buoyant vessels. A communication.

1041. Daniel Reading, of Claverdon, Warwick. An apparatus for ventilating and increasing the draught in fire-places and flues.

1043. Pierre Victor Beaumesnil and Charles Erhard, of Paris. A new and improved system of wheels for railway and other carriages.

1045. Charles Barlow, of Chancery-lane. Consuming the smoke and gases of furnaces, and at the same time furnishing a hot air blast, being a smoke and gas consuming hot air blast furnace. A communication from T. Aldridge, of Hudson, U. S.

1047. John Ramsbottom, of Longsight, near Manchester, engineer. Improvements in wrought iron railway chairs, and in machinery for manufacturing the same and other articles.

Dated April 14, 1857.

1049. Peter Wicks and Thomas Goulston Ghislin, of the Cape of Good Hope. Superseding the use of bristles, cocoa fibres, flax, hemp, whalebone, &c., to be styled and called an invention for adapting and applying the fibrous plants of South Africa for the purposes of manufacture.

1051. John Rubery, of Birmingham. Improvements in the manufacture of umbrella and parasol ribs.

1053. Richard Archibald Brooman, of 166, Fleet-street, London, E.C., patent agent. Improvements in machinery for mixing, solidifying, pressing, and moulding. A communication from M. Evrard.

1055. Robert Knowles, of Manchester, manager. Certain improvements in machinery or apparatus for winding yarn.

1057. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in machinery or apparatus for raising and forcing fluids. A communication from J. Lasserre.

1059. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improvements in carding engines. A communication.

1061. Henry Willis of Manchester-street, Gray's-inn-road, organ builder. Improved machinery for supplying air to organs and free reed instruments.

Dated April 15, 1857.

1063. John Coutts, of Wellington-lodge, Northumberland, naval architect. An improved method of uniting together the parts of all kinds of floating bodies composed of metallic substances, as well as vessels for containing fluids, gases, &c.

1065. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improved apparatus for taking the measurements of coats and other garments. A communication from L. Derby, of New York.

1067. Bonnet Frederick Brunel, of Hampstead-road, Middlesex, civil engineer. Improvements in raising sunken vessels and other submerged structures and articles, and in machinery and apparatus employed therein.

1069. Thomas Richardson, of Newcastle-on-Tyne, and Manning Prentice, of Stowmarket. Improvements in the manufacture of manure.

1071. Jean Baptiste Leuillet, of Paris, civil engineer. Improvements in binding account and other books.

Dated April 16, 1857.

1073. George Raggett, of Duke-street, Saint James', Middlesex, wine merchant. Improvements in railway breaks and carriages. A communication.

1075. Samuel Thomas Crook, of Halifax, York, ironmonger. Improvements in the mode or method of manufacturing iron retorts, safes, cisterns, ovens, boilers, chests, and other similar articles of iron manufacture.

1077. Robert Hindle, of Sabden, Lancaster, calico printer. Improvements in that apparatus used in calico and other printing known as the sieve.

1079. Isaac Sherwood, of Birmingham, drysalter, and Joseph Blount Wayne, of the same place, machinist. Improvements in certain apparatus to be attached to vehicles for the purpose of acting as a check upon the drivers or conductors of such vehicles, by indicating the number of passengers carried and the distance each has travelled.

1081. Johnson Hands, of Epsom, Surrey. Improvements in kilns and in furnaces and flues, for withdrawing air and vapours from drying and other chambers.

1083. Samuel Newington, of Ridgeway, Ticehurst, Sussex, M.D. Improvements in structures for growing grapes and other fruit.

1085. William Smith, of Salisbury-street, Adelphi, civil engineer. A smoke-consuming furnace. A communication from Messrs. Sebille, Bartholomey, and Mariotte, of Paris.

1087. George Schaub, of Birmingham, electro-metallurgist. A new or improved manufacture of types for printing.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1108. Charles Barlow, of Chancery-lane. A mechanical apparatus for regenerating the impulsive force of any motive power. A communication from J. Commandeur, of Lyons, France. Dated April 20, 1857.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," April 28th, 1857.)

2972. L. D. Jackson. A pneumatic break or apparatus to be attached to railway carriages or trucks for the purpose of retarding or stopping the same.

2988. J. Platt. Improvements in mules for spinning. A communication.

2998. J. Draper. Improvements in apparatus for grating and crushing salt and sugar.
3003. J. Brown. Improvements in the construction of ships' yards.
3011. J. Murdoch. An improved ship's main pump, applicable to other purposes also.
3017. E. Loos. Improvements in the manufacture of cement, mortar, concrete, and artificial stone.
3028. T. L. Thurlow. Improvements in reaping machines.
3034. W. B. Johnson. Improvements in steam engines and apparatus connected therewith.
3035. W. Smith. Certain improvements in railway rolling stock. A communication.
3052. W. Macpherson. Certain improvements in machinery for spinning and doubling cotton and other fibrous materials.
3054. W. Taylor. Improvements in producing various ornamental effects upon fabrics, paper, and other surfaces.
3057. R. A. Brooman. Improvements in treating pile and cut pile fabrics, and in the manufacture of certain new pile fabrics. A communication.
3081. W. Swain. Improvements in heating and ventilating.
3082. G. Ritchie. Improvements in the manufacture of beds and mattresses.
3093. W. E. Newton. Improved means of preventing the explosion of steam boilers. A communication.
25. J. Harris. Improvements in obtaining and transmitting motive power.
52. R. A. Brooman. Improvements in knitting frames. A communication.
77. J. H. Johnson. Improvements in machinery or apparatus for sewing or uniting and ornamenting fabrics. A communication.
218. C. J. Wiggs. An improved apparatus for feeding or supplying steam boilers with water.
291. W. E. Newton. Improvements in the manufacture of buttons. A communication.
343. G. Wright. Improvements in stove grates or fire-places.
365. P. M. Parsons. Improvements in the permanent way of railways.
389. J. F. Watson. Improvements in the construction of watches.
452. J. Quick, jun. Improvements in apparatus for regulating the drawing off, and the supply of, water and other fluids.
459. J. Goodman. Improvements in apparatus for holding together letters, music, and other loose sheets. A communication.
503. I. Aldebert. An improved shackle for the springs of carriages.
692. W. H. Barlow and J. Samuel. Improvements in cast iron sleepers for railways.
704. W. Makin. Improvements in furnaces and apparatus for generating steam.
747. Sir F. C. Knowles. Improvements in the manufacture of cast steel.
754. W. McCulloch and T. Kennedy. Improvements in stop cocks or valves.
758. T. Yarrow. Improvements in locomotive steam engines.
789. W. Johnson. Improvements in steam boilers and furnaces, and in apparatus connected therewith. Partly a communication.
814. J. Smith. An improvement in applying steam or other aëriform fluids expansively in engines.
836. J. Henderson. Improvements in the manufacture or production of plain and figured fabrics.
838. R. Cassels and T. Morton. Improvements in the manufacture of iron.
840. S. M. Allaire. Improvements in manufacturing hats, caps, and bonnets.
862. J. Ward. Improvements in the manufacture or production of manures or fertilising agents.
871. J. J. Russell. Improvements in the manufacture of metal tubes.
877. W. Childs, jun. Improvements in the construction of expansible boxes, cases, and receptacles.
881. A. Granger. An improved manufacture of safety envelope.
949. W. Sumner. Improvements in machinery or apparatus for preparing, slubbing and roving fibrous materials.
991. A. V. Newton. Improved machinery for cultivating land. A communication.
1053. R. A. Brooman. Improvements in machinery for mixing, solidifying, pressing, and moulding. A communication.
1061. H. Willis. Improved machinery for supplying air to organs and free reed instruments.
1069. T. Richardson. Improvements in the manufacture of manure.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

927. Thomas Freeman Finch.
938. James Combe.
939. William Edward Newton.
941. Jonathan Davidson.
955. John Henry Johnson.
964. John Evans.
1032. Charles Benjamin Normand.
1056. Josiah Penton and James Mackay.
1226. Moses Poole.

LIST OF SEALED PATENTS.

Sealed April 21, 1857.

2657. Julian Bernard.
2674. Charles Wastell Dixey.
2680. John Kinniburgh.
2734. William Edward Newton.
241. David Yoolow Stewart.
341. James Gilroy.
454. John Henry Johnson.
473. Hector Christie.
488. Thomas Clayton.
510. John Henry Johnson.
545. Alexander Mitchell.
547. William Wood.
555. John Henry Johnson.

Sealed April 24, 1857.

2503. Howard Ashton Holden.
2511. George Henry Bachhoffner.
2513. Henry Forfar Osman.
2529. William Armand Gilbee.
2543. William Kopke.
2599. William Clissold.
2641. Andrew Barlow.
2642. François Jules Manceaux and Eugene Napoleon Vieillard.
2668. Richard Archibald Brooman.
2677. Samuel Newington.
2706. John Billing.
2723. Richard Butterworth.
2740. Louis Adolphe de Milly.
2793. Henry Bougleux.
2942. Frederick William Anderton and Joseph Beanland.

50. Henry Bougleux.
88. John Chanter and John Wakefield.
133. Thomas Jackson Milnes Townsend.
237. John Dangerfield.
370. Léon Talabot.
388. Thomas Fielding Johnson and John Williams.
425. Frederic Henry Sykes.
451. William Edward Wiley.
468. Robert Barlow Cooley.
470. John Naylor.

Sealed April 28, 1857.

2531. Samuel Russell.
2538. Louis Adolphe Faure.
2540. Thomas John.
2547. John Thomas Way.
2550. William May.
2557. John Lawson.
2562. Henry Hutton.
2564. Joseph Browne.
2568. John Parbery.
2572. Josiah Stone.
2615. James Webster.
2681. The Honourable William Erskine Cochrane.
2683. Joseph Hacking.
2687. Richard Emery.
2691. John Sutherland.
2706. George Davies.
2717. Esteves Blanchon.
2721. Samuel Cunliffe Lister.
2742. James Montgomery Gilbert.
2653. Louis Dartois.
2767. Thomas Roberts, John Dale, and John Daniell Pritchard.
2805. Alfred Vincent Newton.
2817. Auguste Cellier.
2829. John Brown.
2935. Michael Burke.
3021. Robert Gibson.
99. Arnold Goodwin.
279. Isaac Holden.
281. Isaac Holden.
319. James Hamsher.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

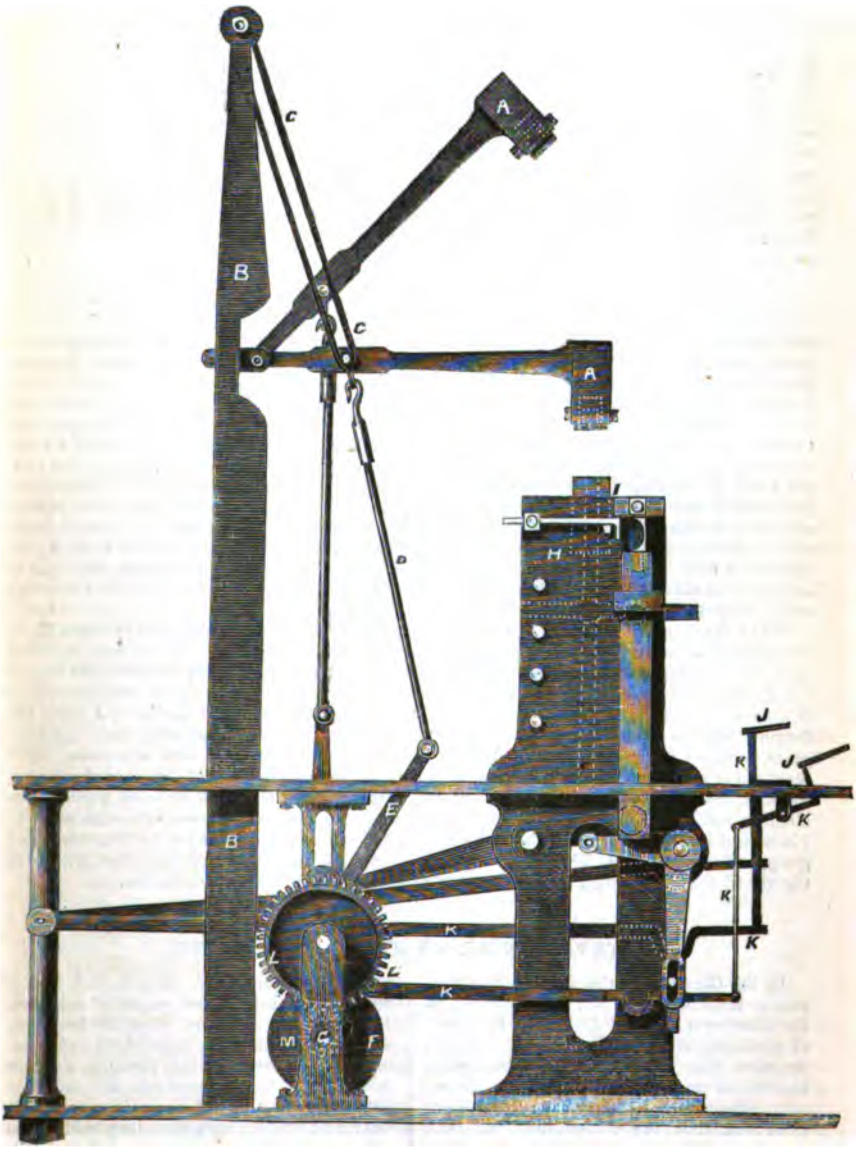
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1761.] SATURDAY, MAY 9, 1857. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

A NEW MACHINE FOR MAKING BOLTS, RIVETS, NUTS, ETC.



A NEW MACHINE FOR MAKING BOLTS, RIVETS, NUTS, ETC.

Our attention has recently been called to a new and very effective machine for making bolts, rivets, nuts, and other similar forgings, with rapidity and economy. This machine is in operation in the engineering department at the Royal Dockyard, Sheerness, and, from its simplicity and convenience, merits the attention of engineers and manufacturers. It is contrived so that it may be put in operation by means of a pulley placed upon any running shaft whatever, whether driven by steam, water, or other power. It is completely under the control of the workman, and may be continued at work for any period without the use of his hands, which are left wholly free to handle the articles which are in course of formation. By the aid of this machine a single workman produces 60 half-inch bolts, 1½ inches long, with hexagonal heads, per hour, or one per minute. These bolts are far superior in finish to any we have seen, and, being accurately made to gauge, the delay and expense occasioned by the use of a number of spanners for the same size bolts are avoided. Rivets are made as fast as the iron can be heated at the workman's forge, and nuts at least as fast as bolts. We here state what has been really done by the machine; and we have no doubt that its capabilities are not yet by any means fully known. The inventor is Mr. James Marrow, who is a subordinate officer in the Steam Department of the Dockyard at Sheerness, under the able superintendence of Mr. Blaxland, Chief Engineer of that establishment. The invention has, we understand, been provisionally protected.

The accompanying engraving represents the new machine. Each of a set of three (or more or less) hammers, A, A, A, is pivoted or centred near one end of it to an upright framework, B, B, or other suitable support, and between that end and the hammer head is attached to the hammer a spring, C, of vulcanized India-rubber (or other suitable substance), which extends upwards, and is fixed to the framework, B, B, or other support, at some distance above the hammer. Between the pivoted end of the hammer and the hammer head is also attached the end of a connecting rod, D, which extends downwards, and is connected below to one end of a lever, E, the other end of which is capable of being brought into contact with a tappet wheel fixed on a rotating shaft, G, or with any other suitable revolving contrivance adapted to communicate motion suddenly to the said lever, E, at intervals. An anvil, H, furnished with a number of holes corresponding to the number of hammers, is provided, and into these holes are placed swages, dies, or tools, I, which are counterparts of others so fitted into the hammers, H, H, as to come down upon those in the anvil when the machine or apparatus is at work. A footplate, J, J, and a system of levers, K, K, are connected with each hammer, and arranged so that the workman using the machine or apparatus is able to bring the tappet lever of either of the hammers down within the range of the tappet wheel, F, to be put in operation thereby.

When the machine is not in use all the hammers are kept elevated by the springs, C, C, but when it is desired to work any one of the hammers, the foot of the workman is placed upon the corresponding foot-plate, J; the tappet lever is thus brought down, the tappet wheel, F, which is driven by the spur wheel, L, and pinion, M, sets it in motion, and its motion is, by means of the connecting rod, D, communicated to the hammer, A, and the forging may be proceeded with until the foot of the workman is removed from the foot-plate. Either of the remaining hammers may be similarly brought into operation. The machine is also furnished with cutters, with gauges for determining the length of the forged articles, and pins for ejecting them for the dies or tools, and with dies and punches for shaping and punching nuts, &c., the latter being also put in operation by means of foot-plates and levers. The anvils have additional holes formed in them for holding tools and gauges of various kinds. The foregoing description, although somewhat imperfect, will, with the aid of the engravings, render the construction of the machine intelligible.

TESTIMONIAL TO MR. SCOTT ARCHER.

In the *Chemist* for the present month, a public testimonial to Mr. Scott Archer, as the discoverer of the "Collodion Process" of photography, is suggested. The editors propose that an immediate subscription should be raised, and will be happy to receive subscriptions. They say: "We trust, moreover, that the Government will take into its consideration the vast service which it has derived from the use of the collodion process, at home and abroad, and that it may reward him as he so richly deserves. It is to be hoped that our scientific brethren, and all professional photographers and amateurs, who have derived pleasure or gain from the collodion process, will at once come forward and aid us in this undertaking; and we feel sure that they will do so with pleasure."

THE STEAM TRANSPORT "TRANSIT."

The *Times* of Tuesday, April 28, contained an extract from the letter of a military officer, dated Corunna, April 19, and written from on board the steam transport *Transit*, which has sailed with the 90th regiment for China. The writer says: "Here we are! done up! Two days' 'Bay' weather sent us in here to be fresh rigged! You never saw a worse sea boat in your life—crank, top heavy, *and everything that's bad!* * * * Such an old tub you never saw; the rigging *never set up*, or anything secured; we had hard work to keep the masts from going over the side; if she had pitched instead of rolling, I am sure the foremast must have gone over the bows * * * In fact, a greater tub to roll I never saw. She is top heavy. I am certain she will never weather the Cape * * * She is a disgrace to the British Government, and more so to the dockyard authorities. * * * There are not one dozen men (troops) on board with a dry hammock, every seam in her deck letting in water."

This is clearly not very careful, nor very scrupulous criticism, but it served its purpose, and on Thursday appeared a second letter from a gentleman who evidently accepted it all without suspicion—who wondered why the Admiralty, if they cannot build transports, do not buy or hire them from those who can—and who, on Sunday last, "threw increased fervency into his prayer for those who travelled by land and water," and "thanked heaven" that he was "*Haud in Transitu.*" On the same day, the *Times* itself evinced the same credulity as its correspondent, and, with its accustomed dexterity, repainted the dismal picture, and carried our thoughts forward to the time when "the 90th may arrive in China old men with snowy beards, to tell the sad experience of long years of wandering."

Now it is no business whatever of ours to meddle with the romancings of the *Times* when its inventions are innocent; but as the 90th have left anxious families behind them, and as the *Times* has filled some of these with the apprehension that their gallant kinsmen are to be converted into a company of very ancient mariners, even if they are fortunate enough to escape a worse fate, we think it will be well to put our readers in possession of a few facts which will, we hope, allay all the fears which fictions—or a landsman's notions of life on board ship, which are often as foolish as fictions—have excited.

What the general public know best of the *Transit* is this: that she was appointed to take the Peers to the great naval demonstration at Spithead, and through a break down in her engines disappointed her noble passengers; that before starting upon her voyage to China she was anchored in too shallow water, and in a fog was carried by the tide upon her anchor, which knocked a hole in her bottom; and, that she has recently put into Corunna for the purpose of having her rigging set up afresh. It may also be generally known that she carried troops to and from the Crimea during the war, and that on more than one of her passages she was delayed by defects in her engines.

Now, if an intelligent reader will examine these facts, he will observe, that not one of them affects, in the smallest degree, the merits of the ship herself. Her engines are shown to have been bad, her rigging imperfectly fitted, and her management, on one occasion at least, unskilful. But the ship herself is in no way compromised. Put bad engines in the finest ship you have, and she will be liable to come to a stand still, however illustrious the passengers on board of her: send the most perfect ship in existence through the Bay of Biscay with slack shrouds, and her masts will bend and tremble: let the tide drive the strongest ship that swims the seas upon her anchor, and the chances are that she will come off it rather worse for the blow!

The only real defects which have ever been shown to belong to the *Transit* are, therefore, but two—bad engines and slack rigging. Now, the first of these no longer exists. She is now fitted with a splendid pair of new engines, made by Penn and Co. There can be no question whatever, therefore, that the cause which delayed the Crimean troops, and made the Peers indignant, is swept away. The Admiralty have, it would appear, in this instance done, the only thing that the Administrative Reform Association itself could desire; that is, they have pulled a pair of the worst engines out, and put a pair of the best in.

With regard to the slack rigging, we may state first, that the ship was rigged at Portsmouth, in great haste—in two days only, we believe—with new rigging; secondly, that new rigging is always likely to stretch more or less in rough weather; and, thirdly, that if rigging is at all capable of being slackened, the waves of the Bay of Biscay are the very things, of all others, to slacken it. We may add, that if it happen to slacken, no sailor would be rash enough to attempt to set it up afresh while in that Bay, and hence the *Transit* has very judiciously been run into Corunna for the purpose. Of course there may be room for just blame of the officers of the ship, or of the dockyard, as the case may be, for having allowed her to go to sea with rigging not properly set up; but no one but a highly

imaginative man would have drawn from such a circumstance the dreadful predictions which the *Times* has announced.

"*Haud in Transitu*" asks, "If the Admiralty cannot build transports, why do they not buy or hire them from those who can?" The *Transit* was bought of "those who can." She was built by Mare and Co., of Blackwall, and purchased for the transport service during the war. We are ashamed to find a man who is ignorant of this first fact concerning her, writing to a public journal with so much assurance. It should make us suspicious of newspaper correspondence.

Having now cleared away all grounds of prejudice against the *Transit*, we proceed to notice the remarks of the gentleman who writes lugubriously from Corunna. He states that the *Transit* is "crank, top-heavy, and everything that's bad." Now it happens that we are in a position to completely refute these statements, and to prove that she is a vessel of unusual stiffness. A year or two since, the Admiralty authorities instituted a set of experiments for the express purpose of ascertaining the stiffness of several of their ships; and one of these very ships was the *Transit*. This stiffness in her case was found both when she was laden and when she had but a small quantity of coal on board, no water in the boilers, and nearly thirty tons of ballast on her upper deck *—these latter conditions being more unfavourable to stability than any that can possibly occur to her while employed as a transport, and contrasting to the fullest extent with her condition in the Bay of Biscay, when she was laden with a full allowance of fuel, water, provisions, stores, &c.

The rationale of the experiment we give further on; but in order to put the facts in the plainest possible form, we will here compare the results given in the case of the *Transit* with those obtained in the case of the *Pearl*, and of the *Satellite*, a sister ship to the *Pearl*, these being new class screw corvettes of so much stiffness that they (or vessels of the same class) have had an extra deck put over them, and part of their armament mounted upon it. If we express in numbers the ratios of the moment of stability to the moment of the sails—which is the measure of the stiffness of the ship under canvas—then, while the *Pearl* and the *Satellite*, are each represented by the number 54, the *Transit* will be represented by the number 69. This is when the vessels are light. When they are deep the numbers are, *Pearl* and *Satellite* each 84, and *Transit* 119. The relative stiffnesses under steam alone are, when light, *Pearl* and *Satellite* each 53, *Transit* 67; when heavy, *Pearl* and *Satellite* each 82, *Transit* 116.

As a further evidence of the stiffness of the *Transit*, we may compare her stability with that of the *Adventure* (formerly the *Resolute*), which was justly praised in the *Times* of Tuesday, May 6, by Mr. J. Laird, of Birkenhead, who built her. These ships are of about the same size, the displacement, or weights, differing only by 3 tons, that of the *Transit* being 2,751 tons, and that of the *Adventure* 2,748 tons. The stability of each of these ships was estimated approximately, the decks, engines, masting gear, equal weights of ballast, &c., being taken into account; and while the stability of the *Adventure* was found to be 5,130 tons, that of the *Transit* was no less than 8,484 tons.*

Nothing can be more conclusive than these results, and we oppose them with perfect confidence to the letter from Corunna. They show that the *Transit* is the very reverse of crank and top-heavy. In some minds, however, the question may arise—If the *Transit* really is a stiff, stable ship, how comes it that a passenger should have pronounced her crank and top-heavy, and formed to roll like a tub? This is a problem susceptible of numerous simple solutions. The writer may have just entered upon his first sea voyage, and a young military gentleman, steaming for the first time through the Bay of Biscay, is not at all unlikely to think the craft that carries him a particularly uneasy ship. Any ship that takes a young fellow to sea for the first time in his life, is extremely likely to be considered precisely what the *Transit* is said to be, viz., "everything that's bad." Even Mr. Scott Russell's most perfect packet brings down indignation upon her accomplished builder, when she is unfortunate enough to bear from Newhaven to Dieppe the youthful tourist on his first trip to the Continent. But there are so many causes that may induce a soldier to write exaggerated descriptions of sea voyages to his friends at home, that we think it unnecessary to discuss this point further. We have refuted the writer's assertions by facts, and we may further add, that on all her previous voyages the *Transit* has been pronounced, by those who were the best judges of her merits, a very excellent ship. Indeed, the opinion formed upon the reports of her officers was that, leaving her engines (the old ones) out of the question, she was the best ship in the entire transport service.

The gentleman who writes from Corunna, states that the decks of the *Transit* let water in at every seam. We can only say that,

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* One thousand troops are included in the lading in each case.

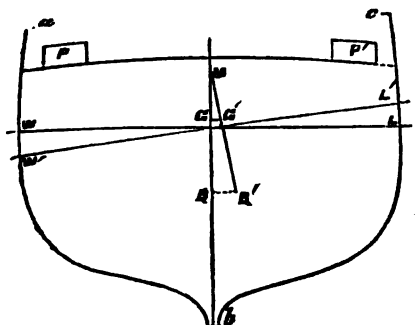
* This estimate was made before the experiments for discovering the centres of gravity of the *Transit*, and other ships, were instituted, and is therefore only approximate.

we do not believe his statement. We know something of the manner in which the decks of ships are caulked in the Royal Navy, and we cannot believe it possible that the decks of a nearly new ship, recently fitted in a dockyard, are in such a condition. The decks of the *Transit* may have leaked in the Bay, for decks do, and will leak, more or less, in rough weather; but, we suspect, she is but little, if any, worse than other vessels in this respect.

We have now, we believe, satisfactorily shown, that readers having friends or relations in the *Transit* have nothing unusual to apprehend on account of the ship that transports them. She is a safe, commodious, well-furnished, and easy vessel, and will doubtless perform her voyage as well, and perhaps as speedily, as any of the fleet of noble vessels launched from the slips of her builder.

It only remains for us to describe the very interesting experiments instituted by the Admiralty to test the stability of the *Transit* and other vessels—experiments which we hope will be repeated for every class of ship in the Navy.

They are of such a simple nature, and the calculations from the data furnished by them are so readily performed, that, with due care, they cannot fail to insure a sufficiently accurate assignment of the position of the centre of gravity. Their *rationale* may be thus briefly exhibited:



Let $a\ b\ c$ represent the transverse section of a ship taken through G, the centre of gravity; W L the water-line when the ship is floating in the upright position; b B M, the corresponding middle line, which is therefore vertical; B the centre of buoyancy, and P a weight or weights on the deck, such as guns, ballast, &c., capable of being readily transported to the opposite side of the deck.

If, then, the weight, P, be moved across the deck to P′, the vessel will incline, *cæteris paribus*, through an angle depending in magnitude upon the magnitude of the weight, and the distance through which it is moved. When the vessel permanently assumes a new position of equilibrium, the centre of buoyancy will be moved from B to B′, and the centre of gravity G to G′, so that the line joining B′ and G′ will be perpendicular to the new water-line, W′ L′, and will make the same angle with the middle line, b B M, as the water-lines do with each other, and B′ G′ produced will meet b B M in a point M. This point, when the inclination does not exceed 5° or 6°, may, without any appreciable error, be assumed coincident with the metacentre.

From the property of the "centre of gravity" we know that, since the weight, P, has been moved in a horizontal direction from P to P′, the centre of gravity of the vessel has also moved in the same direction; therefore G G′ is horizontal and parallel to P P′; and from another property of the same point $W \times G\,G' = P \times P\,P'$, or

$$G\,G' = \frac{P \times P\,P'}{W},$$

where W represents the weight of the vessel.

But $G\,G' = G\,M \times$ tangent of the angle between the middle line and the new vertical line B′ G′.

$$= G\,M \times \tan.\theta \text{ suppose}$$

$$\therefore G\,M = G\,G' \cot.\theta = \frac{P \times P\,P'}{W} \cot.\theta \quad (A)$$

The weight W is known from the displacement of the ship calculated to the draught of water accurately taken at the time of the experiment; M is the metacentre, also calculated at the same draught of water, and the angle θ is found with the greatest exactness in the following manner:

A thick board, above 20 feet long, is nailed to the combings in the main hatchway, in a vertical direction, when the ship is upright; and on its lower end a thin straight batten is nailed at right angles to the board, or horizontally; from the upper part of this batten a distance, of 20 feet say, is carefully set off upwards, and at the height thus obtained, a small nail is driven into the board, and to it is attached a plumb line, the plummet hanging freely below the batten. When the vessel is upright the point where the plumb line intersects the upper edge of the batten is carefully marked, and when she has attained her second position of equilibrium by the movement of the weight, the new point of intersection of the plumb line and upper edge of batten is marked; the distance in feet between the two points marked on the batten, divided by 20, is equal to the tangent of the angle of the ship's inclination.

The weight P is of course known, as well as the distance through which it was moved in a transverse direction, to produce the inclination; the right hand side of

equation (A) therefore contains all known quantities, so the distance of the centre of gravity from the metacentre is also known, little labour being required to produce the result.

It may be observed that the observations, if conducted in a careful manner, give results so astonishingly accurate, that the heights assigned to the centre of gravity from *seven independent experiments* on the same ship, were all located within a space of half an inch.

Our readers will readily perceive that the distance of the centre of gravity below the metacentre, multiplied by the displacement, is a measure of the vessel's stiffness or stability; for if she be kept inclined by some external pressure to any angle θ, the moment of this pressure about the centre of gravity must be equal to the moment of the pressure of the water about the same point; now the moment of the water's pressure

$$= W \times G\, G' \cos\theta = W \times G\, M \tan\theta \times \cos\theta$$
$$= W \times G\, M \sin\theta,$$

and since a ship's stiffness is evidently measured by the moment of the force required to keep her inclined at any given angle θ from the upright position, it will be measured by the product of the weight or displacement, and the distance G M—the distance the centre of gravity is below the metacentre; and if the displacement be the same, the stiffness will be measured simply by G M.

STEAM NAVIGATION AND NAVAL ARCHITECTURE.

The following is an abstract of a paper read at the Institution of Civil Engineers, on Tuesday, March 10, 1857, by Mr. Robert Armstrong, on "High Speed Steam Navigation; and on the Relative Efficiency of the Screw Propeller and Paddle Wheels," upon which we propose to offer a few observations.

The first part of the paper was devoted to the consideration of the circumstances which appeared to limit the maintenance of higher speeds than were now attained by steam ships, in deep sea navigation, and the causes which had hitherto prevented the asserted high speeds of steam navigation on the American rivers from being attained in England.

It was remarked, that it was of primary importance in calculating the velocity of steam ships, to "separate the performances of the machinery from the question of the form of the vessel;" for it was believed that the increased effective power of the engines had been completely neutralized by the theory of the sharp water line, and that the speed which had been hitherto attained was not due so entirely to the skill of the naval architects as had been asserted. Where great speed had been obtained, it was shown that it was always with a proportionately small midship section, augmented length, and increased steam power, above the ordinary proportions of other steam ships.

It was argued that the propelling power was as the square of the velocity, and not as the cube, which was the prevailing opinion; and that the formula based on this law, and on the fact that one effective horse power was required for one square foot of midship section, to produce a velocity of 10 miles per hour, would be,

$$V^2 \text{ (in miles)} = \frac{\frac{2}{3} \text{I.H.P.} \times 100}{\text{Mid. Section.}}$$

It was shown that the actual speed of sixteen out of twenty-nine screw steamers was within 10 per cent. of the speed calculated by this formula, the results being given in a table, in which the midship section, the indicated horse power, the actual speed in miles, the pitch of the screw, and the number of revolutions per minute were given. Variations from the formula might arise from imperfections of the engine, the form of the propeller, and the immersion of the vessel. The midship section was not always the greatest section to the line of motion, especially in screw steamers, and at velocities of 13 miles per hour, or upwards, the immersion of the after end rapidly increased. With coarse pitched screws, the actual was less than the calculated speed by the formula. It was suggested that the "angle from the axis of the screw" would be a better expression for the pitch than that now adopted.

The report of the trial of the French war steamer *Charlemagne* was quoted in support of the author's views. With two boilers there was an expenditure of 3,064 lbs. of coal, to propel the vessel at the rate of 8 miles per hour, and with three boilers the consumption was 2,659 lbs. of coal to attain the same speed; whilst with four boilers, and a consumption of 5,733 lbs. of coal, the speed was 10·9 miles per hour. According to the square theory, to attain the speed of 10·9 miles per hour, with two and three boilers respectively, would involve an expenditure of fuel, as shown in the following proportions:

$$8^2 : 3{,}064 \text{ lbs.} :: 10{\cdot}9^2 : 5{,}688 \text{ lbs.}$$
$$\text{and } 8^2 : 2{,}659 :: 10{\cdot}9^2 , 4{,}936$$

whilst according to the cube theory these proportions would be

$$8^3 : 3{,}064 \text{ lbs.} :: 10{\cdot}9^3 : 7{,}749 \text{ lbs.}$$
$$\text{and } 8^3 : 2{,}659 :: 10{\cdot}9^3 : 6{,}744$$

whereas the actual consumption with four boilers for a speed of 10·9 miles per hour was, as before stated, 5,733 lbs., the midship section being in both cases nearly equal. This report also showed a saving of fuel of 4 tons per day, by increased boiler space. It was stated, that in sea-going steam ships, 5 lbs. of coal per diem might be taken as the consumption of one effective horse power. It was remarked that the system adopted in the French navy, of recording, in minute detail, the results of the trials of their steamers, was to be commended, and that it was one well worthy to be extended to this country, as it could not fail to be of essential service in the improvement of naval architecture.

From the arguments adduced, the author concluded:

1st. That in the separation of the performances of the machinery from the question of the form, in calculations of velocity, the duty of the naval architect was merely to provide the requisite displacement at which the vessel might float, with the proposed immersed midship section, and to show the stability, the strength, and other properties required in a vessel, all considerations for velocity being entirely the province of the engineer.

2nd. That the rate of sailing between two vessels, with an equal moving power in each, did not depend on the form of water-line, but entirely on the area of the greatest section to the line of motion.

3rd. That displacement in the line of direction did not materially add to the resistance; and

4th. That the friction between the sides of the vessel and the water need not enter into any calculation, for any required velocity.

It was asserted that the requisite principles were not fulfilled, for the maintenance of higher speeds than were now attained by steam ships in deep sea navigation; and that the length of the vessel was the most important element for this purpose; a comparison being drawn between H.M.S. yacht *Fairy* and the *Himalaya*, the speeds of which were nearly identical, whilst the other proportions were very dissimilar, as the latter was three times longer, had twenty times the displacement, and yet had only five and a half times the power of the former. It was believed that an increase of 200 feet in the length of the *Himalaya* would be advantageous, as it would enable 2,000 tons of extra cargo to be conveyed at the same velocity; and by doubling the present power on board, a speed of 22 miles per hour might be obtained, with an increase in the consumption of coals of only 300 tons, still leaving space for 1,000 tons of cargo, with the same immersed midship section. If a further extension of length of 200 feet was made, the displacement would be increased three times, and, the power being similarly increased, a speed of 27 miles per hour might be obtained, and the distance from Liverpool to New York would be accomplished in five days. The proportions last indicated were, it was thought, very similar to those of the *New World*, one of the most recent of the American river steamers. It was shown, from Admiralty records, that the four vessels having the largest proportional displacement to nominal horse power, and also to the midship section, were the most efficient for speed, proving that the midship sections, and not the weight, was the sole basis for calculations of velocity, and that displacement in the line of direction did not increase the resistance. It was believed that the *Great Eastern* steam ship, now building, would be propelled at the rate of 18 miles per hour, if the engines worked up to the same indicated horse power as the *Himalaya*, and that 10 tons would be conveyed at the same speed and cost as 4½ tons.

When the fact was received that the midship section was the sole basis for calculations of velocity, the best form of waterline could soon be decided, and the stability and other requisite conditions in the construction of vessels could be established. Then with a form of vessel increased in length amidships, without the risk of that continual change which had existed during the last twenty-five years, and which was a strong proof of the absence of established principles in naval architecture, machinery could be most profitably employed in the building of ships.

In the second part of the paper the relative efficiency of the screw propeller and paddle wheels, when applied to vessels of identical form, tonnage, and steam power, independent of the use of sails, was considered. For this purpose the trials of the *Himalaya*, a screw steamer, with the *Atrato*, a paddle wheel steamer, were referred to. The engines were valued by their efficiency, £60 per nominal horse power being taken as a basis for testing their economy, the consumption of coal per effective horse power, and that required to propel one ton of displacement a given distance were calculated, and the efficiency of the vessel for velocity was tested by a common standard of resistance. From this it resulted that—

	Himalaya.	Atrato.
Value of engine per effective horse power ...	£25 12 0	£32 1 0
Consumption of coal per effective horse power...	5·5 lbs.	6·3 lbs.
One ton of displacement carried one mile by......	·146 lb.	·181 lb.
Ratio of actual rate to rate given by formula.	100	83

"The engines of the *Himalaya* were, therefore, 20 per cent. more efficient than those of the *Atrato*, the consumption of coal was 14 per cent. less, the displacement carried bore about the same per centage, and the efficiency for speed, in these two examples, was that the paddle wheel was 17 per cent. less than the screw propeller.

The subject of naval architecture and of steam navigation never possessed more interest than at the present moment. It is manifest that, in a very short time, the number of vessels in which steam is the chief propulsive power, whether in the public service or connected with private enterprise, will be out of all proportion greater (at least in aggregate tonnage and importance) than those which depend solely on the wind. There are now many, and there will soon be more companies of persons embarked in steam-navigation enterprise. Anything, therefore, which tends to throw light on the scientific and economic questions connected with such enterprise, must necessarily attract considerable attention, and excite strong interest. It is to this circumstance more than any other, that Mr. Atherton is indebted for the degree of attention which has been bestowed upon his agitation, with regard to steamship arithmetic and shipping registration. The directors of steam-navigation companies are ready to adopt any suggestion which would really assist them in their difficult task of conducting their speculations to a profitable result. Mr. Atherton promises to do much for them in this respect; and although he rides his hobby to death, and squeezes out of his single formula a great deal more than experience will fairly warrant, yet we are far from denying that he has done good service in bringing prominently before the commercial public the advantages which flow from a due regard to science in shipbuilding, and in the manufacture and adaptation of engines, in a merely pecuniary point of view. As we have frequently insisted in these pages, Mr. Atherton has, in our opinion, only damaged a good cause, by his subsequent onslaught upon the Mercantile Shipping Act of 1854.

A Mr. Armstrong, it seems, has been devoting his attention to the same subject, and, in his very laudable efforts to trace the causes which have limited to so great an extent the realization of high rates of speed in deep-sea navigation, has elaborated a theory, which he gave to the public in the paper an abstract of which we have given above. Were it not for the extraordinary interest which this subject at present excites,—exemplified by a three nights' discussion at this Institution, during the course of which much valuable matter was elicited from several of its leading mem-

bers, and by the presence of the Astronomer Royal himself, who came down to calm the agitátion which the novel theory has produced—there is nothing in the paper itself which would have claimed any notice at our hands, or justified the Council of the Institution in question, in recording it among its " Res Gestæ." We cannot regret that the discussion was provoked, for it showed the existence of a wide-spread and useful agitation on this subject in professional quarters: but the exciting cause—Mr. Armstrong's paper itself—hardly warranted the Council in stamping that importance upon it which a reading before that influential body implies. Although in the present instance the end has, by its success, justified the means, we think the Council will best consult their own dignity and reputation by abstaining as much as possible from so dubious a course as the sanctioning by a public reading at their table essays whose scientific value, or rather valuelessness, is so unmistakable as that of Mr. Armstrong.

Those of our readers who have taken the trouble to peruse the abstract of this paper which we have inserted, and who are at all conversant with the subject of it, will not need to be informed that the formula which the author wishes to substitute for that commonly received, viz.,

$$V^2(\text{in miles}) = \frac{2}{3}\,\frac{\text{Ind. horse power} \times 100}{\text{Mid. section}}$$

is entirely founded on a scientific misconception. Mr. Armstrong's fallacy consists in confusing resistance or force with what engineers call power, and mathematicians call work, or labouring force, which is the product of force and space passed over. He very properly says that " the science of hydrostatics asserts that the resistance is as the square of the velocity," but as improperly goes on to say that " the propelling power (meaning thereby the effective horse power to overcome that resistance) varies as the square—and not as the cube, which is the prevailing opinion at present with respect to steam navigation."

The theory that the resistance varies as the square of the velocity, which, though not strictly, is approximately true, forms the foundation of the usual formula which Mr. Armstrong disputes, viz.,

$$\frac{V^3 \times (\text{Displacement})^{\frac{2}{3}}}{\text{Ind. horse power}} = C.$$

If A^2 be the *effective midship section* of a vessel, and B^2 a constant dependent only on the size and immersion of the paddle floats, then the effective horse power (which may perhaps be considered as proportional to the indicative horse power)

$$\propto \frac{A^2}{B}(A+B)\,V^3.^*$$

For the same vessel this evidently varies as V^3, and, if B be *supposed* proportional to A, that is, if the size and immersions of the paddle floats be proportional to the midship section for different vessels, then

$$\frac{A^2\,(A+B)}{B} \propto A^2,$$

and for vessels of a similar make and form $\propto (D)^{\frac{2}{3}}$, if D be the displacement; whence we obtain the formula

$$\frac{V^3 \times (\text{Displacement})^{\frac{2}{3}}}{\text{Ind. horse power}} = C.$$

A similar expression applies to screw vessels.

It is evident that, *if the assumptions above made* be correct, the expression, so obtained is strictly true. These assumptions are, however, only approximately correct. Still, the formula sought to be substituted for this by Mr Armstrong, being founded on the supposition that the horse power, which is the product of the mean pressure on the piston and the velocity of the piston, is equal to the simple pressure against the vessel's bows, is clearly untenable. It is never difficult to construct an empirical formula, which shall, for a limited number of vessels, express the velocity within 10 or 15 per cent., or to institute a comparison favourable to it with another formula supposed to represent another principle—especially when the latter formula is constructed, not according to the admitted rules, but according to the fancy of the constructor, as is the case in the present instance; Mr. Armstrong asserting, that the " formula " on the cube theory " would stand thus,

$$V^3 = \frac{2}{3}\,\frac{\text{Ind. horse power } 1{,}000}{\text{Mid. section}}."$$

* The steps of the investigation for paddle wheels (see Main and Brown's " Marine Steam Engine ") are as follows:

Let R = resistance of the water against the vessel's motion when moving with velocity V.

R′ = mean pressure of the floats against the water, the floats moving with the velocity v.

Then, when motion is uniform,

$$R = R';$$

$$\text{also } R = A^2V^2$$

$$R' = B^2(v-V)^2$$

$$\therefore A^2V^2 = B^2(v-V^2)$$

$$\text{whence } v = \left(1+\frac{A}{B}\right)V$$

Also, if P_1 be the effective pressure on the surface of the piston and V_1 its velocity, then

$$P_1V_1 = R'v = B^2(v-V)^2v =$$

$$A^2V^2\left(1+\frac{A}{B}\right)V = \frac{A^2}{B}(A+B)V^3.$$

This is the first time this formula has been brought forward, and the maintainers of the cube theory will certainly not be inclined to adopt it.

The citation of the report of the trial of the French war steamer *Charlemagne* is by no means conclusive, inasmuch as the conditions under which the trial was made are not stated. The important conclusions at which Mr. Armstrong arrives, so far, at least, as they depend upon his scientific data, our readers will be prepared to find resting on no solid foundation. The separation of the performances of machinery from the work of the naval architect is not better effected *theoretically* than it used to be. There is nothing in the true formula which is capable of showing how much of the good effect is due to the lines of the ship, and how much to the efficiency of the engine or of the propeller. Nor, again, is there reason for concluding that the rate of sailing between two vessels, with an equal moving power in each, does not depend on the form of the water line, but entirely on the area of the greatest section to the line of motion. According to this theory, a cylindrical vessel, whose section is throughout equal to the midship section would be the best form, because we could thus obtain the maximum displacement for a given quantity of material. We need hardly observe that every day's experience contradicts this. The form of a vessel *before* the midship section materially affects the amount of resistance which it meets with. The elaborate experiments of D'Alembert, Bossut, and Condorcet, and those also of Colonel Beaufoy, abundantly establish this fact. Every one knows that if a hemisphere be placed in a fluid with its base vertical, it will require to move it with a given velocity with the curved surface first only two thirds of the force necessary to move it with the flat base first. That the addition to a ship's displacement (within certain limits) by letting in a portion amidships, the general form of the bows remaining unaltered, does not materially add to the resistance, may be conceded. But this by no means proves that the resistance does not depend most materially on the form of the bows.

Mr. Armstrong's fourth and last conclusion, "That the friction between the sides of the vessel and the water need not enter into any calculation for any required velocity," if the material of which the ship is composed is wood, is not very novel. The three French philosophers of last century, whose experiments have been already alluded to, fully established this fact. The friction of iron, however, is much more considerable in amount; and it would seem that in large iron vessels a very appreciable proportion of the horse power is consumed in overcoming this friction. The many advantages of iron, as the material to be used in the construction of ships, are, in some measure, counterbalanced by this disadvantage—that the friction, in proportion to the wetted surface, is so considerable as experiments have shown it to be.

It would hardly have been worth while to notice this paper, the errors of which are so palpable, were it not for the extraordinary interest shewn in this question, manifested by a discussion which occupied the evenings of the 17th, 24th, and 31st March, and the light which the discussion throws upon the present state of the science of steam navigation. We do not propose to lay this discussion before our readers in detail, but rather to state our own conclusions, referring to the discussion when it serves to illustrate our views.

Much has been said and written of late on the applications of the formula

$$\frac{V^3 \times (\text{Displacement})^{\frac{2}{3}}}{\text{Ind. horse power.}} = C.$$

Our readers are doubtless aware that there is another corresponding formula also in use, namely,

$$\frac{V^3 \times \text{Mid Section}}{\text{Ind. horse power.}} = C.$$

We have already briefly pointed out the mode in which these formula are deduced from the received theory of resistance, namely, that it varies as the square of the velocity.

Some writers (among them Mr. Atherton) have confined their attention entirely to the former of these formula. In the paper recording the progress of screw propulsion, put forth by the Steam Department of the Admiralty, both of these formula are employed. We believe that much instruction may be derived from the careful comparison of the constants or index numbers so obtained for different vessels from both of these formulæ, and that one is incomplete without the other. In the short analysis we gave of the mode in which these formulæ are obtained, we found the true expression for paddle wheel steamers to be

$$\frac{\frac{A^2}{B}(A+B)V^3}{\text{Ind. h. p.}} = \text{Constant (for same vessel)};$$

and by assuming that B—a quantity depending entirely on the size and immersion of the floats—is proportional to A^2, the effective mid-section

$$\frac{A^2}{B}(A+B)V^3$$

may be replaced in the formula by $A^2 V^3$.

Now, A^2 is in reality the resistance to the bows of the vessel, when the velocity is unity, or one knot an hour. The quantity A^2 depends not only on the magnitude of the immersed midship section, but also on the proportion in which the resistance is reduced below that due to the resistance against this section, considered as a plane moved directly through the fluid, by the form of the vessel, forward. There cannot be a question that the form of the bows does exert a most material influence on the amount of this. Supposing then that ships were precisely similar in form, when floating at their load draught, this resistance would vary for different ships precisely as the midship section or (Displacement)$^{\frac{2}{3}}$. But whenever the form of the vessel does not fulfil the condition of similarity, the resistance cannot be considered as proportional to the midship sections, still less to the (Displacement)$^{\frac{2}{3}}$. Clearly, for the same midship section, the smaller the corresponding value of A^2 the better the result, so far as the form of the ship is concerned; and it is easy to see that the smaller the value of A^2 the greater is the value of C.

Now in a commercial or economical point of view, the greater the displacement—that is, weight of the ship, cargo, &c.,—that can be carried at a given velocity, or the smaller the indicated horse-power that can carry a given displacement at a given velocity, or, lastly, the greater the velocity at which a given indicated horse-power can carry a given displacement—the more efficiently is the service performed.

The comparison, therefore, instituted by means of the formula

$$\frac{V^3 \times (\text{Displacement})^{\frac{2}{3}}}{\text{Ind. horse-power}} = C$$

between different vessels is most valuable and instructive. But it is evident that, in order to reap the full benefit of this comparison, we must know not only the displacement, but the midship section and the general form of the ship—that is, we must accurately know her lines. There is, of course, a difficulty in obtaining all this information, and in further acquiring a knowledge of all the other qualities of the ship, as her stability, ease of working, weatherliness, &c. For a sea-going ship, these last qualities are of, at least, as much importance as her efficiency for carrying cargo at good speeds in smooth water.

While we therefore admit to the fullest extent the value of the formulæ in question, we must warn our readers against supposing that they supply us with all the information we require. There is, however, one use which it is now competent to the directors of all steam-ship companies to make of them. Every ship has a proper value of C corresponding to it; and it is therefore easy to compute, when that is known by trial, what indicated horse-power corresponds to a given velocity, and hence what is the consumption of coal that ought to be expended in maintaining this speed on a given voyage. In the direction of all steam navigation companies, there ought to be at least one person of sufficient scientific attainments to be charged with the responsibility of making these calculations, and enforcing the corresponding economical use of fuel. It would not be beneath the consideration of the Admiralty to enforce this economy on board H.M. ships; and if, after the calculation of the constant for each ship had been carefully made, a periodical return were required of the number of hours each ship was under steam, of the speed at which she was then going, and of the quantity of coals consumed, and this return were carefully inspected by a proper officer, and compared with the results of the formula, a very considerable annual saving of fuel, and consequently of cost to the country, might be effected.

Complaints are constantly made of the very insufficient return which steam navigation companies receive for their outlay. We do not see how this state of things can be remedied unless a searching and efficient control be maintained over the steam department; and a proper application of the formula in question will alone enable the directors to establish such control.

Late experiments, of which an abundance was cited in the discussion, seem to have established a very remarkable and unexpected result; unexpected at least by all but a few who, like Mr. Scott Russell, have always acted on this theory—viz., that for each form of ship there is a limiting velocity beyond which it cannot be made to go with a due regard to economy. It is no exaggeration to say, that the greater number of vessels, whether in government or private service, are overpowered; that is, their greatest speed is obtained by a sacrifice of economy. By a careful comparison of the results of trials of vessels working at full speed and at inferior speed, it is found, in most cases, that the horse power expended is not proportional to the cube, but more than this law gives, and sometimes proportional to the fourth or a higher power of the velocity. Now, as direct experiments give us reason to believe that the resistance against the bows of the vessel varies nearly as the square of the velocity, and as, if this only were to be overcome by the engine, the horse power should vary as the cube, it is evident that a portion of the horse power represented by the difference between that corresponding to the cube and the fourth or

other higher power of the speed is *uselessly* expended; that is, after making all allowances for slip, and the ordinary resistance of friction, &c., &c., there is this considerable amount of horse power expended, of which no good account can be given. The probability is, that when a steam vessel is urged to proceed at a higher speed than that which corresponds to her form, there is some condition of the water in which the screw or paddle wheel works, which is inimical to the efficient action of the propelling instrument: there is most probably an abnormal amount of disturbance in the water itself; and consequently an abnormal amount of resistance to the screw-blade or paddle-wheel in other directions than that of the motion of the vessel.

This is so remarkably illustrated by the recent trials on H. M. S. *Flying Fish*, that we cannot forbear noticing them a little in detail.

When this vessel, which is built on very fine lines, both forward and aft, was tried on July 3rd, the engines, with full power, made 74⅓ revolutions per minute. The indicated horse power was 1106 06 and a mean speed was attained of 11·603 knots; with ¾ power or 68¼ revolutions, ind. horse power 877 gave a speed of 11·201; and at half power, or 59 revolutions, 576 ind. horse power gave a speed of 9·923. The horse powers corresponding to these speeds varying according to a considerably higher power than the cube. She had afterwards a temporary bow fitted on, giving her a finer entrance, but effecting no other change, and was again tried on September 16th; when with full power, 77 revolutions of the engine, ind. horse power 1309 gave a speed of 12·572 knots; with ¾ power, or 68 revolutions, 918·72 ind. horse power gave a speed of 11·150, and at half power, or 60 revolutions, 660·18 ind. horse power gave a speed of 10·120. In this case the horse power was proportional to the cube of the speed; and the fair inference is, that the form given to the vessel by her temporary bow was that which properly corresponded to the maximum power the engines were capable of exerting; while without this temporary bow, a speed of nearly a knot per hour less was obtained by a disproportionately high exertion of power.

Some interesting experiments on vessels of his own construction, made by Mr. Scott Russell, were adduced by that gentleman, all pointing in the same direction.

Nothing can be more evident than that the expenditure of a higher rate of horse power than that which belongs to the velocity on the cube theory must be wasteful. It is, then, well worth the careful consideration of all persons interested in steam ships, either as owners or builders, whether it be not worth their while to give more careful attention than they have hitherto given to the adapting of the form of their ships to the speed it is intended to attain, and not urging them to higher speeds than their form warrants. Although much has been done in the way of experimenting on this point, much still remains to be done; and it were well that in all trials this question were kept steadily in view.

Another very important point was adverted to in this discussion; and that is the friction opposed to the passage of iron through water. It appears that experiments have been instituted in order to ascertain the resistance offered to water passing freely through iron pipes; and the coefficient of friction thus ascertained has been found to be very considerable. At the velocity of 15 feet per second the resistance of water amounted to 25 ounces per foot superficial.

The best means of reducing this friction might well employ the thoughts of the practical chemist.

It would seem that Mr. Hawksley, assuming that the effect of this friction is equivalent to making an addition to the effective mid-section of a vessel, has instituted experiments for the purpose of obtaining formulæ to connect the velocity and horse power of steam vessels. His results are,

$$H = V^3 \left\{ \frac{a}{174}\left(\text{Sin.}^2\frac{\theta}{2} + \text{Sin.}^2\frac{\theta'}{2}\right) + \frac{s}{25125} \right\} \quad (1)$$

$$V = 29 \left\{ \frac{H}{144a\left(\text{Sin.}^2\frac{\theta}{2} + \text{Sin.}^2\frac{\theta'}{2}\right) + s} \right\}^{\frac{1}{3}} \quad (2)$$

in which H is the effective horse-power (= about 4-5ths of the indicated horse-power), (a) the area of mid-section in square feet, (θ) the angle of the bow lines, (θ') that of the stern lines, and (s) the immersed or wetted surface of the vessel in square feet. It would be interesting to see a record of the series of experiments undertaken to verify these formulæ. All that we can say at present is, that empirical formulæ of this kind require to be applied to a very extended range of cases, varying as far as possible from one another in all their circumstances, before they can be received, and then they must be applied with the greatest caution. Unfortunately the state of science, as regards fluid resistance, does not furnish any reliable data on which theoretical expressions for the resistance to the bows of a vessel can be calculated. Whatever is done in this way must be done by means of empirical

formulæ, which are clumsy, and but little trustworthy expedients at the best.

Some very pertinent remarks were offered in the course of the discussion on the supposed advantages of working steam expansively. It was suggested—and we believe with truth—that most of the advantages of working steam expansively resolved themselves into this—that less power was developed, and the vessel brought consequently, in most cases, more nearly to the condition in which the limiting rate of speed according with its form was attainable. Hence the economy of the expanded steam, because the horse-power was thereby brought more nearly to be proportional to the cube of the velocity.

Such discussions as those which took place in the Institution of Civil Engineers on the reading of Mr. Armstrong's paper, cannot fail to be beneficial. We should be glad to see more frequent opportunities for agitating these questions; for we are convinced that they would result in great practical improvements in the building of steam vessels, and in the adaptation of their engines to them.

The three nights bestowed on this important and interesting subject by the Institution, were assuredly not the least useful of the session.

REAL IMPROVEMENTS IN THE MANUFACTURE OF IRON.

It will be within the recollection of our readers that the first person who stepped forward to guard the public against over-confidence in the statements made by Mr. Bessemer in his celebrated British Association paper upon the manufacture of iron, was Mr. Charles Sanderson, of Sheffield, who contributed to this and other journals an able article upon the subject. The name of Mr. Sanderson previously stood very high in the metallurgical world; but his bold and (as events proved) judicious resistance to the Bessemer excitement gave him greater influence than ever among scientific men. It is therefore gratifying to us to announce that the improvements in the manufacture of iron which were patented by Mr. Sanderson in the early part of last year have been carried into operation with the best possible results.

In the present modes of manufacturing iron, many of the impurities which become combined with the metal in its descent through the blast furnace are further incorporated with it in the puddling furnace; and being incapable of removal by any of the subsequent processes, remain to deteriorate and weaken the finished metal. It is true that some of our principal iron works, and particularly the Low Moor Works, are at this moment producing iron of very excellent quality; but, at the same time, it is unquestionable that the purest iron produced, even at those works, is susceptible of further refinement.

Mr. Sanderson's objects, in effecting his improvements, were, first, to separate and discharge from the crude iron, whilst in a fluid state, all the deleterious non-metallic matter contained in it; secondly, to obtain a metal of great purity, by running out the metal from the furnace in which it is refined, and thus allowing the metallic matter and scoria to separate, leaving a purified metal suitable for subsequent manufacture. In carrying out his invention, he uses a common reverberatory furnace, and either melts pig iron upon the bed of it, or draws the molten mass direct from the blast furnace. When the metal comes to rest in the reverberatory furnace, the slag is skimmed from the surface, and a chemical re-agent, capable of disengaging oxygen during its decomposition, is then added. Carbonic acid or carbonic oxide gases being thus produced, the oxygen contained in them combines with the carbon of the fluid iron, and the combined gases either pass off as such, or react upon the silicon, sulphur, phosphorus, arsenic, and other impurities of the fluid iron, separating them from the metallic part, and allowing the earthy matters to flow away as slag containing but a very small percentage of iron. This is essentially the whole of the improved process, which differs from previous inventions in which chemical compounds have been introduced with the pig iron into the puddling furnace, inasmuch as it *discharges* the earthy matters, instead of merely forming new combinations of them.

The new process is not a mere theoretical improvement, but has been practically tested in the manufacture of many hundred tons of metal, and has resulted in the production of an iron having greater strength and tenacity, superior hardness, higher specific gravity, and clearer and purer colour than any that we have before seen, this opinion being based upon an inspection of numerous specimens, comprising a variety of finished articles, from cast iron bells of the finest tone down to drawn wire of the most pliable character.

We learn with pleasure that the improvements of Mr. Sanderson are about to be carried out into general operation, under his own skilful management. The improved metal will therefore, in all probability, be soon introduced into the market.

RECENT IMPROVEMENTS IN SMALL ARMS AND ORDNANCE.

We intimated, in our last Number, that we should probably return to this subject in the present number; and although our space is so much occupied that we shall be able to find room for a very few words only, we think it necessary to submit the following remarks to our readers.

To constitute a trial of the merits of any invention as compared with one already in use, the conditions of such trial should be equal. Now in the trial of Whitworth's rifle, in no one particular was this formula observed. The rifle of Whitworth was of smaller bore, and heavier barrel than the Enfield, and furnished with a hard metal projectile carefully fitted to the bore, and fired with the best sporting gunpowder.

The following is a table descriptive of the Enfield and Whitworth balls:

		ins.
Enfield ball,	Diameter	·567
"	Length	1·000
"	Material, soft lead	
Whitworth,	Diameter major	·491
"	" minor	·439
"	Length	1·400 in.
"	Material, a mixture of 3 parts lead and 1 part tin.	

It has been long known and practically shown by our leading gun makers, that to secure a low trajectory, and consequent accuracy in rifle practice, a small bore, a heavy charge of powder, and long projectiles were absolutely necessary; and the published records of the Swiss military arms, as well as the practice of modern deer-stalkers, with their favourite weapon—the oval bore rifle—have long shown this; and Mr. Whitworth, before he began his costly experiments, was told the conditions that were absolutely necessary as to bore, charge, quality of powder, and description of ball, by Mr. Lancaster, whom he consulted as to how he was to proceed in conducting these experiments, and whose advice he has followed in the formula of his rifle as to diameters of bore, powder, &c., at the eleventh hour.

In addition to these facts it should be stated, that the accuracy of the shooting of the Whitworth is not unparalleled. Better shooting was, years ago, made with other arms, and at longer distances; and the Enfield rifle, were it reduced to the same calibre as Whitworth's, would shoot as well, if not better. The penetration so much talked of is due to *the tin in the composition of the ball* of the Whitworth rifle.

In short, no new fact has been demonstrated by Mr. Whitworth, and no novel or real improvements *in machinery for producing arms* have resulted from vast outlay of public money.

One good will accrue from this trial; it will force the "*irresponsibles*" to give the soldier better rifle powder, without which no reduction in the calibre of the military arm is possible.

PARCHMENT PAPER.

At a recent meeting of the Royal Institution, the Rev. J. Barlow, M.A., F.R.S., Vice-President and Secretary, lectured "On some Modifications of Woody Fibre and their Applications."

The principal subject of Mr. Barlow's discourse being the *parchment paper* invented and patented by Mr. W. E. Gaine, C.E., and about to be introduced into commerce by Messrs. Thomas De la Rue and Co., he confined his remarks principally to the physical and chemical properties of vegetable fibre when converted into paper. Having reminded the audience that, in all cases, a change in chemical constitution accompanied the change in physical properties, Mr. Barlow contrasted with the pyroxylised textures of Kuhlmann and the gun paper of Pelouse, the woven fabrics subjected to Mercer's process, and the *parchment paper*, the invention of Mr. Gaine. By acting on cloth with chloride of zinc, tin, or calcium, with sulphuric and arsenic acid, and, especially, by the caustic alkalis in the cold (the temperature sometimes being lowered to − 10° Fahr), Mr. Mercer has obtained many important effects on the fineness and general appearance of cloth, and its susceptibility of dye. This subject was brought before the Royal Institution by Dr. Lyon Playfair, C.B.,* and it has since been closely investigated by Dr. Gladstone.† Mr. Mercer also experimented on the effect of acids on paper. It being known that sulphuric acid, under certain conditions, modified vegetable fibre, Mr. Gaine instituted a course of experiments to ascertain the exact strength of acid which would produce that effect on paper which he sought, as well as the time during which the paper should be subjected to its action. He succeeded in discovering, that when paper is exposed to a mixture of two parts of concentrated sulphuric acid (*s. g.* 1·854, or thereabouts) with one part of water, for no longer time than is taken up in drawing it through the acid, it is immediately converted into a strong, tough, skin-like material. All traces of the sulphuric acid must be instantly removed by careful washing in

* Proceedings of the Royal Institution, vol. i., p. 134. (1852.)

† Journal of the Chemical Society, vol. v., p. 17. (1853.)

water. If the strength of the acid much exceeds or falls short of these limits, the paper is either charred, or else converted into dextrine. The same conversion into dextrine also ensues, if the paper be allowed to remain for many minutes in the sulphuric acid after the change in its texture has been effected. In a little more than than a second time, a piece of porous and feeble unsized paper is thus converted into *parchment paper*, a substance so strong, that a ring seven-eighths of an inch in width, and weighing no more than 23 grains, sustained 92 lbs.; a strip of parchment of the same dimensions supporting about 56 lbs. Though, like animal parchment, it absorbs water, water does not percolate through it.

The strength of this new substance, before alluded to, and its indestructibility by water, indicate many uses to which it may be applied. It will, probably, replace, to some extent, vellum in bookbinding; it will furnish material for legal documents, such as policies of insurance, scrip certificates, &c.; it will take the place of ordinary paper in school-books, and other books exposed to constant wear. Paper, after having been printed either from the surface or in intaglio, is still capable of conversion, by Mr. Gaine's method; no part of the printed matter being obliterated by the process. *Parchment paper* also promises to be of value for photographic purposes,* and also for artistic uses, in consequence of the manner in which it bears both oil and water-colour.

INVENTORS' MUSEUM AT SOUTH KENSINGTON.

In our Number for January 21, we announced the establishment of an Inventors' Museum and Library at Kensington. On Saturday last we visited the building to observe what progress had been made, and were pleased to find that the Museum is fast approaching completion, and that a considerable number of excellent models have been received for exhibition. The library will not, we suspect, be extended beyond the official publications of the Commissioners of patents—indexes, specifications, &c. The works of reference accumulated for the patent library will, of course, be retained at the chief library, Southampton-buildings, as it would be impossible for men of business to journey to Kensington whenever they had to make a search, or consult a volume. The Museum will, however, be extended to any necessary magnitude, as it will not be required to answer the same purpose of frequent and immediate reference as the library. We are gratified to observe that Mr. Woodcroft is very wisely endeavouring to bring together in this Museum models classified and arranged in such manner as to tell the historical tale of the gradual improvement of each branch of practical art and manufacture. When this is once accomplished it will be comparatively easy to keep up the system, and thus to preserve in the country a simple and enduring record of its industrial progress. Too much praise cannot be given to Mr. Woodcroft for his efforts in this direction, and we trust that manufacturers and inventors will heartily co-operate with him in effecting his object. We shall defer publishing an account of the models exhibited at Kensington until the Museum is open to the public; we may, however, state that the central object is the actual steam engine (restored by J. Penn and Co.) which Symington applied first to the propulsion of a vessel. Of this engine, which has been searched after and found by Mr. Woodcroft, we shall give an historical and descriptive account in an early number.

* Photographs on this paper were exhibited.

RANSOME'S PROCESS FOR PRESERVING STONE.

The preservation of stone is a subject which has, within the last few years, received a large proportion of attention from various persons. Oleaginous or gummy compounds have been tried for the purpose, and proved to be of little avail, they, of necessity, becoming decomposed after a brief exposure to the atmosphere. Mr. Ransome having turned his attention to the matter, has, therefore, sought for an indestructible mineral, which he has succeeded in producing in the following manner: — The stone or other material is coated or saturated, wholly or superficially, with a solution of soluble silicate, and has afterwards applied to it a solution of chloride of calcium, by which an insoluble silicate of lime is formed in the body of the stone. In place of a soluble silicate and chloride of calcium, other preparations may be used; the invention consisting in the application in succession of two solutions, which, by mutual decomposition, produce an insoluble substance, which is deposited in the structure and on to the surface of the stone or other material. This compound is remarkably tenacious and cohesive. One important feature in Mr. Ransome's process is, that it not only prevents new stone from decaying, but effectually prevents the further decay of that which is already rapidly approaching disentegration. The efficacy of this mineral is not confined to stone alone, but may be applied to brick, lime,

stucco, &c., &c., with equally effective results. The patentee has been making some important experiments upon the New Houses of Parliament, and we trust he will not have the dissatisfaction of finding his invention disregarded by those who should be the first to avail themselves of it. If it is advisable to expend so many thousands on the erection of a structure to adorn our metropolis, it is surely the duty of those in whose hands the discretion lies to take advantage of the means here offered for preserving the same.

ANOTHER LAUNCHING FAILURE.

Failures in the launching of large ships appear not to be confined to our own dockyards. We learn from the *Scientific American* that the magnificent steam ship, the *Queen of the Pacific*, of about 3,000 tons, intended to run between Panama and San Francisco, was to have been launched on the 8th ult. at New York, but met with a disaster very much like that which our own *Cæsar* experienced at Pembroke Dock, and the *Marlborough* at Portsmouth. The cause of the failure appears, however, to have been more apparent in the New York case. Our contemporary says, the preparations having been completed. the vessel "was duly started down the inclined plane prepared as usual for the purpose, but the motion was quite moderate, and when about half her length had crossed the water's edge diminished, until she actually stopped. The excitement among the parties interested was, as may be supposed, immense, and jack screws, steam tugs, &c., were put in immediate requisition to persuade her farther; and powerful derricks, tugs, and other like contrivances, have been since swarmed around her, but, up to the hour of our going to press, without avail, and the expense in getting her off will doubtless be very considerable. The misfortune is due partly to a too great hardness or consistency of the grease employed, and partly to neglecting to dig away the earth at one point, which was so high that it rubbed seriously against her bilge as she attempted to pass."

LIGHT WAR VESSELS.

The *Nautical Magazine* justly complains that our Government does not devote attention to building war vessels of light draught, say 12 feet, provided with a few heavy guns. They would be of great service in pursuing pirates, especially about the coast of China, where these villains are very active, and would be important for defensive operations. The gun boats in such quantities of the English Government, and now being hauled up for preservation at the British dockyards, are some of them of only six feet draught, and could, in case of war with that power, penetrate our inland waters, and bid defiance to all our present *naval* vessels, though they would probably be somewhat troubled from other sources.—*Scientific American.*

THE PATENT LAW OF INDIA.

We are authorised to state that a dispatch has been transmitted to India, directing the initiation of a new law under the sanction of the Crown, and the insertion therein of a clause saving the rights of those inventors who had filed specifications under the act above mentioned.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Johnston, J. *Improvements in photographic plates.* (A communication.) Dated Sept. 5, 1856. (No. 2072.)

This consists in taking photographic portraits upon thin plates of metal, one side of which is coated with black japan to receive a collodion coating.

Park, S. W., and E. S. Ells. *Improvements in machinery for knitting tubular ribbed fabrics.* Dated Sept. 6, 1856. (No. 2076.)

The patentees use two annular series of hooked needles, the barbs of each series being turned outward, and the two series so arranged that the hooked ends of one set are parallel, along-side of, and pointed opposite to those of the other series. They also adopt a mode of constantly drawing the fabric from the needles with uniform tension, and a mode of retaining the needles of an annular series in place of the needle block; also certain other appliances.

Newton, A. V. *Improved machinery for cutting round files.* (A communication.) Dated Sept. 6, 1856. (No. 2080.)

The patentee produces round files with teeth in rows running spirally round them, by turning the file upon its axis, at the same time feeding it forward as it is cut. It also consists in supporting the file upon a bed immediately beneath the point where the cut is made.

Lapito, C. L. *A machine for manufacturing of mortar and concrete.* Dated Sept. 6, 1856. (No. 2081.)

The specification of this patent is unintelligible to us.

Fontainemoreau, P. A. L. de. *Certain improvements in making artificial stone for statues and ornamenting purposes.* (A communication.) Dated Sept. 6, 1856. (No. 2083.)

The inventor mixes argil with red ochre or iron ores (about one-fifth argil). This mixture is pulverized and sifted, and then sprinkled with acidulated water. The product resembles ordinary plastic clay, and may be moulded by any known means.

Hodge, P. R. *Improvements in grinding wheat and other farinaceous grains, and in the treatment of the products therefrom.* Dated Sept. 6, 1856. (No. 2085.)

This consists—1. In constructing the runner and bed of a mill of cast or wrought metal, to receive water internally as a cooling medium. 2. In constructing a casing around the bed stone and runner of wrought metal, having an annular chamber to circulate water. 3. In circulating water in chambers or a casing around the trunks of screw conductors, elevators, or meal or flour chambers, for further cooling the meal or flour after it has passed through the mill. 4. In the use of a current of air passing between the grinding surfaces by exhaustion, in combination with water as cooling mediums.

Estivant, F. *Improvements in casting metal tubes.* Dated Sept. 8, 1856. (No. 2087.)

This consists in a new system of casting moulds for the casting of metallic tubes, principally those of copper, so as to obtain drawn tubes as well as printing cylinders used for the printing of stuffs. *Claim*—The application of this system in a casting mould of metal of varied dimensions, with a core of sheet iron or other metal filled with sand, for casting tubes and printing cylinders, which allows the patentee to make tubes of pure copper, without soldering of any length or thickness.

Chalus, A. G. *Certain improvements in stopping bottles and other vessels.* Dated Sept. 8, 1856. (No. 2088.)

This cannot be described without engravings.

Fowler, J., jun. *Improvements in machinery or apparatus for ploughing and tilling land by steam.* Dated Sept. 8, 1856. (No. 2089.)

These apply — 1. To the guiding of ploughs drawn by stationary steam power, and consist in applying a locking motion to the central axle and wheels, so as to cause the ploughing machine to be guided, by the ploughman giving motion to a screw acting on the central axle, so as to cause it and the wheels thereon to perform the requisite locking motion. 2. To obtaining progressive movement in the anchoring carriage. The axle of the pulley carried by such carriage, and around which the draught rope passes, is caused to give motion by intermediate gearing to the axles of the disc wheels on which such anchoring carriage moves, by which means the draught rope is put in motion by a steam engine, and in addition to moving the ploughs or tilling instruments gives motion to the anchoring carriage.

Sabatier, B. *Improvements in photography.* Dated Sept. 8, 1856. (No. 2092.)

This consists of certain instruments all of which are based upon a new principle of construction, and are designed for photographic manipulation. They cannot be described without engravings.

Herring, F. M. *Improvements in applying magnetic action to combs and brushes.* Dated Sept. 8, 1856. (No. 2093.)

The object here is so to charge a comb or brush with magnetic power that it may be capable of transmitting the magnetic action to the skin of men or animals. It consists of a brush with metallic wires in the place of bristles, a magnet being connected with such wires.

Restell, T. *Improvements in breech-loading fire-arms and ordnance.* Dated Sept. 8, 1856. (No. 2094.)

This invention consists of an arrangement of the parts of a breech-loading fire-arm (or piece of ordnance) in a very compact, strong, and effective manner, the breech being opened by sliding back a longitudinal bolt or breech piece. The arrangement requires engravings to illustrate it.

Petrie, W. *Improvements in the manufacture of sulphuric acid, and the apparatus employed therein, parts of which improvements are applicable to the manufacture of nitric, hydrochloric, and other acids.* Dated Sept. 8, 1856. (No. 2095.)

This is an invention of considerable merit, but a description of it would require considerable space, and several illustrations.

Newton, A. V. *Improved machinery for cutting India rubber and other substances into threads or narrow slips.* (A communication.) Dated Sept. 8, 1856. (No. 2096.)

This machinery is applicable to the cutting of India rubber thread from rubber made into an endless belt or fillet. The belt is strained over rollers or cylinders, which, when revolving, present one edge of the belt to a pair of rotary knives or cutters, whereby the edge is cut off into thread.

Watson, J., and C. F. Halle. *Improvements in spinning or twisting fibrous materials.* Dated Sept. 9, 1856. (No. 2097.)

An inverted flyer is used, that is, the legs or arms of the flyer project upwards from a tubular spindle collar carried in bearings in horizontal bars, and fitted with a wharve or pulley, or a toothed wheel, by means of which it is driven. The thread or yarn descends from above in the usual way, and passes through the eye of one of the flyer legs to a central spindle upon which it is wound. This spindle passes down through the tubular spindle of the flyer, and rests

on a bar or rail, a vertical reciprocating movement being imparted to it by the rail to regulate the building up of the yarn or thread.

GOSSAGE, W. *Improvements in the manufacture of certain kinds of soap.* Dated Sept. 9, 1856. (No. 2100.)

Claims.—The production of compound soaps containing silicate of soda or of potash, in which the proportionate quantity of free soda or potash previously contained in the silicate employed, or in such compound soap, has become reduced by the use of acids.

BROOMAN, R. A. *An improvement in and apparatus for sprinkling substances in a state of powder.* (A communication.) Dated Sept. 9, 1856. (No. 2101.)

This consists in sprinkling substances in a state of powder by means of a brush, broom, or a bunch or tuft of cloth, hair, fibre, wire, or other material, to which the powdered substance is supplied through a perforated plate, or handle, or otherwise, so that the powdered substance may have no other issue except through the perforations, and thence through the filaments or pieces of the brush, broom, or bunch.

BROOK, C., jun. *An improvement in polishing or finishing yarns, threads, and woven fabrics.* Dated Sept. 9, 1856. (No. 2102.)

The yarns, &c., are acted on by the surfaces of rollers caused to move at a high surface speed, so that they become heated by friction, and thus give to the yarns a high polish or finish.

SMITH, W. *A powerful compound whistle.* (A communication.) Dated Sept. 9, 1856. (No. 2105.)

This relates—1. To the combination of several whistles upon the same pipe or steam tube, such whistles having dissimilar tones. 2. To a mode of shaping the parts of such whistles.

COOKE, H. *Certain improvements in dyeing yarns or threads.* Dated Sept. 10, 1856. (No. 2106.)

This consists in dyeing yarns, &c., in "Kenworthy's tape leg machines," and in the adaptation of such machines to this purpose by the use of dyeing or colouring troughs or vessels, rollers, &c., previous to the dressing or sizeing of the yarn.

TAYLOR, J. *An improvement in building walls.* Dated Sept. 10, 1856. (No. 2113.)

Face plates or slabs, each made with a flange on its inner lower edge, are used, in combination with concrete, in pairs, so as to form blocks of concrete faced on the two surfaces, or, what is preferred, several of the facing plates or slabs are arranged end to end in parallel lines, the flanges being inwards. Concrete is poured into the space between.

WHITE, S. *An improved method and apparatus for the distillation of certain oils, or oily substances, from the petroleum, commonly called "earth oil," found in certain districts in the Birman empire, and an improved method of purifying the oils or oily substances so obtained.* Dated Sept. 10, 1856. (No. 2115.)

This consists in distilling Eupion, Eupion oil, and paraffine, by several boilers or stills working in connection with each other in one continuous operation; and in the use in purifying the said oils, &c., of common salt, neutral chromate of potash, and sulphuric acid in combination; and proto-sulphate of iron, or green vitriol, and carbonate of soda, or carbonate of potash, in combination as chemical agents.

WEBSTER, W. *Improvements in troughs for feeding animals.* (Partly a communication.) Dated Sept. 10, 1856. (No. 2117.)

This consists in the use of a guard fitted over the feed trough, to prevent the animal from putting his feet into the trough. This guard may be fixed either to the front of the pen, or to a hanging door.

OLDHAM, W. *Improvements in the manufacture of cement, and in treating or preparing colouring matter for cement.* Dated Sept. 10, 1856. (No. 2119.)

These improvements consist in first grinding the lias limestome to a powder and mixing it with clays. The limestone and clay are then rendered plastic, and formed into suitable shapes for burning or calcining, after which they are reduced to a state suitable for cement, when it is fit for use; also in reducing the lias limestone by stones similar to mill-stones used for grinding wheat. The improvement in the colouring matter consists in grinding coke, breeze coal, coal slag, or charcoal used to a fine paste while wet, after which it is dried and reground with the cement.

FORSTER, W. H. *An improved fastening for articles of jewellery, brooches, or dress ornaments.* Dated Sept. 10, 1856. (No. 2120.)

This consists of curvilinear or talon-shaped pins secured so that the attaching or detaching of the ornament is effected by simply pressing sliding stems or end pieces which slide within a tube, &c.

ROBINSON, J. B. *Improvements in machinery for effecting agricultural operations.* (A communication.) Dated Sept. 11, 1856. (No. 2121.)

These improvements refer to former patents granted to J. H. Johnson, May 10, 1853, and Jan. 6, 1855.

GEDGE, J. *Improvements in paints or colouring matter applicable to coating metals and other substances, whereby the oxidation of metal is prevented, and resistance to the ac-*

tion of the atmospheric rays of heat or acids is secured. (A communication.) Dated Sept. 11, 1856. (No. 2122.)

The patentee mixes "Jews' pitch," with Bayonne essence. Say to ½ cwt. of Jews' pitch he adds ¾ cwt. of essence of Bayonne. A moderate heat is applied, and the mixture stirred.

HUDSON, J. *Improvements in whetting or setting "printers' doctors" and other straight edged tools or instruments.* Dated Sept. 11, 1856. (No. 2123.)

This consists in the employment of a rotating grindstone instead of files, and an apparatus for holding the blade or doctor capable of sliding to and fro. The blade traverses from end to end, in contact with the edge of the grindstone. A true straight edge is thus obtained. The patentee can set the blades to any angle or bevel of edge. Oil stones are also mounted on the ends of spindles, to which he gives simultaneous rotary motion, and the said blade or doctor traverses in contact therewith.

BALESTRINI, P. A. *Improvements in protecting and laying telegraphic wires.* Dated Sept. 11, 1856. (No. 2124.)

The telegraphic wires are insulated by a waterproof material, and thus protected from the core of the telegraphic cable, are either laid parallel to each other, or spirally on a core of fibre or of iron wire covered with fibre. Cords of water-proofed hemp are then closely wound spirally round this core, and the cable is consolidated by grooved rollers. The cable can be strengthened by coiling round it (in the opposite direction to the coils of the cords) iron wires, in long open spirals, and over these galvanised iron wire, and by the action of the galvanised wire on the non-vulcanised wire a calcareous deposit is produced round the cable after it has been immersed for some time, by which it is much protected. To facilitate the laying of the cable, a parachute is attached to it at intervals, which is so arranged that, when the cable enters the water, the parachute opens and prevents the cable from being drawn violently through the water.

COWARD, R. A. *Improvements in paddle wheels for propelling vessels.* (A communication.) Dated Sept. 11, 1856. (No. 2125.)

A reduced number of floats are employed. The float-boards are made much deeper than heretofore, for allowing of its adjustment to the velocities of the different kinds of vessels to which it may be attached. Flanges are applied on each side of the floats or paddles, to which, and to the paddle arm, they are secured by proper bolts and nuts.

MILNES, J., and W. THOMPSON. *Improvements in looms for weaving.* Dated Sept. 11, 1856. (No. 2126.)

The leaves of heddles are connected with levers, each of which has a rod with a hook or catch thereon, which is acted on by a spring so as to have a tendency to be in a determined position, and the rising or falling of the leaf of heddles to which any one of the levers is attached, depends on whether its rod with a hook or catch is or is not acted upon by a pin barrel or pattern surface.

PITMAN, J. T. *Improvements in the construction of iron bridges.* (A communication.) Dated Sept. 11, 1856. (No. 2128.)

The improved iron bridges cannot be described without engravings.

CHAPLIN, A. *Improvements in ships or vessels.* (A communication.) Dated Sept. 11, 1856. (No. 2129.)

A portion of the invention consists in forming vessels with a nearly flat bottom, extending from stem to stern, with the exception a slight curving off towards each end. The sides are nearly vertical, and run into the bottom with a slight bend, whilst they are curved in to form the bow and stern. A second portion of the invention consists in constructing vessels without any fixed keel, stem, or stern-post, and in steering them by plates arranged obliquely, either at the stem or bow of the vessel. The third portion relates to the engines. When a vessel constructed as before described is to be propelled by steam, it is intended to use vertical boilers with internal conical flue tubes, placed vertically.

BISHOP, A. D. *Improvements in derricks for raising sunken ships and other heavy bodies from below water, and moving heavy bodies from one place to another.* Dated Sept. 11, 1856. (No. 2130.)

The patentee combines a derrick with a suitable vessel, in order that the derrick may be floated to the locality where it is desired to be used.

CLARK, W. S. *Improvements in hydraulic heaters or furnaces.* (A communication.) Dated Sept. 12, 1856. (No. 2132.)

This consists—1. In enclosing pipes in a water tight chest, and allowing the water to flow around the pipes, and the air to pass through them. 2. In the application of hexagonal tubes.

PITMAN, J. T. *Improvements in repeating fire-arms.* (A communication.) Dated Sept. 12, 1856. (No. 2134.)

The object of this invention is to enable the operations of rotating the breech and firing to be performed easily with a simple arrangement of mechanism, operated by a single pull of the trigger.

HUTCHISON, G. *Improvements in the treatment of oils and fats.* Dated Sept. 12, 1856. (No. 2139.)

Sulphuric acid is added to oil or fat,

and the mixture stirred to avoid carbonisation. In a day or more, new products are formed, and the mixture then contains sulpholeic, sulphomogaric, and sulphoglycoric acids. By the addition of alcohol the sulphoglyceric acid is separated by subsidence. The remaining fatty acids being mixed with further alcohol, undergo decomposition, and form combinations of metaoleic and metamargaric acids, with a portion of the alcohol in presence.

ELLIOTT, J. *An improved apparatus for containing and supplying water, gas, and other fluids, applicable also as a fluid meter.* Dated Sept. 12, 1856. (No. 2140.)

This invention allows of water, &c., being withdrawn from vessels without the admission of air. A flexible waterproof bag, sheet, or disc of India rubber, is affixed in such a way, that it shall, by its own weight, and the pressure of the atmosphere, be forced to the sides of the containing vessel, and down on the fluids as they leave the vessel.

GREEN, E. *Improvements in scrapers employed to cleanse boiler tubes and flues for economising fuel.* Dated Sept. 13, 1856. (No. 2142.)

This consists in improvements in the scrapers patented by the patentee, Dec. 10, 1845. The improvement consists in in forming them with a sharp cutting edge, which, as well as other improved arrangements, requires engravings to illustrate it.

WHITTLE, W. *New or improved machinery for the manufacture of nails.* Dated Sept. 13, 1856. (No. 2143.)

See *Mechanics' Magazine*, No. 1759, p. 385.

PEYTON, R. *An improvement or improvements in the manufacture of metallic bedsteads and other articles for sitting, lying, or reclining upon.* Dated Sept. 13, 1856. (No. 2144.)

This consists in connecting the laths with the framing by means of a slot in the lath engaging with a button on the rail, the slot being transversed, in the lath, and having inclined sides or an oblique position.

JOHNSON, J. H. *Improvements in fire-arms.* A communication.) Dated Sept. 13, 1856. (No. 2145.)

The back end of each rifle groove is ground or filed into the metal of the bore by a cast-steel wheel, the edge or face of which has a cross section corresponding to the deepest part of the groove, but a little larger. The grooves are subsequently completed by traversing cutters acting as in a planing machine. It is preferred to cut the grooves so that their depth shall greatly diminish towards the muzzle, &c.

DUCIMETIERE-MONOD, F. *Improvements in the manufacture of chlorine.* Dated Sept. 13, 1856. (No. 2147.)

The inventor receives muriatic acid gas, produced from salt and sulphuric acid, through pipes leading to nearly the bottom of a vessel into which water has been introduced, through an orifice subsequently stopped and luted. At a few inches from the bottom of the vessel is a perforated bed, upon which manganese is placed through an aperture made in the vessel, and which must be properly closed and luted after the introduction of the manganese. The vessel having been thus prepared, muriatic acid gas is admitted through the pipes to nearly the bottom of the vessel, where it is condensed by the water contained therein. As soon as this water has acquired a certain degree of acidity, and has become heated, the manganese begins to be decomposed, and produces chlorine, which escapes from the acidulated water, and passes off through tubes in the upper part of the vessel, which lead it into a leaden chamber to be washed and purified. This chamber contains water, and the last named tubes descend to within about one inch of the water level. The chlorine is conducted from this chamber to be used as required.

HILL, C. *Improvements in the manufacture of lubricating matters.* Dated Sept. 13, 1856. (No. 2149.)

This consists in combining a saponified substance made from the materials generally used in the composition of soap, and a gelatinous substance made from vegetable matters, and amalgamated with animal, vegetable, or mineral fats and oils, together with caustic alkali, soda, or lime water. And in combining rosin oil or rosin grease (anti-friction grease) with dead or heavy oil, fish or vegetable oils, lime, or argillaceous earth.

LISTER, S. C. *Improvements in preparing and spinning cotton, flax, and similar fibres.* Dated Sept. 13, 1856. (No. 2150.)

The patentee claims the combined process of first reducing the flax, or smaller fibre, to a state of flax cotton—that is, to its ultimate fibre, or nearly so; then combing the same, and afterwards spinning it wet.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

WILKENS, W. *Revolving cylinder battery or cannon, and apparatus connected therewith.* (A communication.) Dated Sept. 6, 1856. (No. 2082.)

This consists in a revolving battery or cannon, by which the different operations of loading, swabbing, pricking, cocking, and discharging are made self-acting by one prime motion of a lever. Also in preventing heating by a circulation of water through chambers in the breech.

TROTTIER, H. E. *An improved portable bath.* Dated Sept. 6, 1856. (No. 2084.)

This consists in the adaptation of a reservoir of hot water, containing a chamber for heating linen, to an ordinary bath.

CRAIG, T. *Improvements in ruling paper and other materials.* Dated Sept. 8, 1856. (No. 2086.)

Arrangements are made for heating the ink or colour, which makes it run easily and ensures its marking the paper, whilst at the same time it dries more rapidly than if cold. The ruling pens or markers are held between metal plates, contrived so as to nip the pens with their front edges.

DALTON, A. *Improvements in smelting iron-stones and ores, and in furnaces used for that purpose.* Dated Sept. 8, 1856. (No. 2090.)

Atmospheric air or steam is introduced under pressure into the hearths of furnaces for the smelting of ironstone and ores beneath the surface of the melted metals, and the opening for the discharge of the melted metal externally is raised to such a height as to allow a large quantity of the melted materials to be always present in the bottom of the furnace; but internally this opening is at the bottom of the furnace, so that the iron may be drawn from the lowest point. Metallic iron is also used as a flux.

BAMFORD, R. *Improvements in looms for weaving.* Dated Sept. 8, 1856. (No. 2091.)

This relates to a mode of securing the reeds employed in looms for weaving to the slay cap, whereby the reeds may be readily changed.

PIDDING, W. *Improvements in the preparation and manufacture of certain piled, corded, or other fabrics.* Dated Sept. 9, 1856. (No. 2098.)

The inventor proposes to improve mosaic or corded fabrics. An elaborate verbal description is given of the improved processes, but drawings are, we think, necessary.

CUNNINGHAM, H. *The production of blanks for bank-notes, bills, checks, treasury-bonds, scrip, stocks, &c., &c., to prevent counterfeiting, &c.* Dated Sept. 9, 1856. (No. 2099.)

The inventor first produces a photographic picture in a negative form, from which positives may be produced in any number by printing. Upon the paper containing this picture is printed the form of the bill, certificate, or note, &c.

SIEMENS, C. W. *Improvements in electric telegraphs and apparatus.* (A communication.) Dated Sept. 10, 1856. (No. 2107.)

The inventor constructs transmitting instruments or relays, so that when acted upon by an electric current passing in one direction, they close the second circuit, and when acted upon by a current in the other direction, they open the second circuit, and on the current ceasing, the instrument still retains its position, so that a momentary electric current in the first circuit produces a permanent closing or opening of the second circuit. A description is also given of an apparatus capable of transmitting signals simultaneously in both directions through the same line wire.

ROBERT, A. *A new process of treating, smelting, and refining copper, tin, and other refractory metallic ores.* Dated Sept. 10, 1856. (No. 2108.)

This consists in mixing metallic ores, in a powdered state, with marl, previously diluted with water so as to be brought to a plastic state; this mixture is placed in a smelting furnace, and heated by burning coke. By this means the finer portion of the metal is separated from impurities.

CUNNINGHAM, H. D. P. *Improvements in reefing sails.* Dated Sept. 10, 1856. (No. 2109.)

This invention consists in producing rotary motion in yards by passing the bands or ropes round the extremities of the revolving yards, to which they are conducted by sheaves or pulleys. At each end of the revolving yards are fixed whelped bosses. The centre of the revolving yard is supported by a saddle fixed to the standing yard. The chains for effecting the rotation are fixed aloft by haulyards, and led through a system of pulleys over the whelped bosses, and through pulleys on the other side of the fixed yards. In lower yards, which do not lower up and down, the rotation is produced by leading the ends of the chain on deck, and hauling on them by tackles.

RILEY, G. *An improved mode of treating maize for distilling, with apparatus therefor.* Dated Sept. 10, 1856. (No. 2110.)

The inventor uses a separate mash tun, with apparatus therein for bringing up the heat of the mash to the point which he finds most advantageous.

NEUENSCHWANDER, J. *Certain improved processes of preparing milk to be preserved.* Dated Sept. 10, 1856. (No. 2111.)

One process consists in parboiling the milk immediately after it has been obtained, agitating it for about ten minutes, and directly afterwards mixing it with a concoction of horse-radish and fresh milk. Another process consists in drawing off the milk, immediately after it has been obtained, into bottles, placing them in a vessel of cold water, and causing the water to boil about one hour. The boiling is then suspended, and the bottles remain in the water a quarter of an hour, when the process is completed.

GILBEE, H. *Improvements in the manu-*

facture of iron. (A communication.) Dated Sept. 10, 1856. (No. 2112.)

This consists in receiving a stream of melted iron from the melting or refining furnace into a suitable trench, and projecting down upon it a strong current of atmospheric air, so that the stream of iron may be thereby cut completely through, and every portion of the metal thus brought successively into contact with it. Bridges or stops are placed across the stream of metal, to arrest the slag or scoriæ.

DAVIDSON, J. C. *An improved construction of share drill.* Dated Sept. 10, 1856. (No. 2114.)

The object here is to provide means of adjusting share drills to the required depth for sowing, and to prevent shifting the position of the shares in their sockets, by mounting the drill frame on adjustable running wheels, fitted like plough wheels, and by transmitting the motion from the running wheels through an intermediate wheel carried by an ajustable swinging arm, which has its fulcrum on the seed roller axle.

DAVIDSON, J. C. *An improved construction of hop bin or hop frame.* Dated Sept. 10, 1856. (No. 2116.)

This relates to the manufacture of hop bins that will admit of their lateral contraction, to enable the workmen to carry them through narrow spaces in the hop field without removing hop poles, and also to allow of their being closely packed away.

JOHNSON, J. H. *Improvements in machinery or apparatus for making bricks.* (A communication.) Dated Sept. 10, 1856. (No. 2118.)

The main feature here consists in the employment of sliding moulds constructed in two halves each way, having angular recesses and projections, the two halves being so fitted that when they are put together a number of rectangular spaces, corresponding in size and shape to the bricks to be moulded, is left.

TRUESDELL, L. E. *An improvement in weight distributing bridges.* Dated Sept. 11, 1856. (No. 2127)

This relates to a mode of trussing beams, or of constructing frames of timber so as to distribute the weight which they are intended to bear equally over the structure.

LEAVER, J. J. *An improved pump for pumping, raising, or forcing water or other liquid.* Dated Sept. 12, 1856. (No. 2133.)

This consists in the working chamber or cylinder of the pump being connected at each end with the suction pipe, and in having a discharge valve at each end, whereby the down stroke is as effective as the up.

KORONIKOLSKI, J. *Improvements in baking ovens.* Dated Sept. 12, 1856. (No. 2135.)

The improved oven consists of a cylinder movable on its horizontal axis, and whose internal space is divided in the direction of its length into cells, which are intended to receive the dough after it has been shaped into loaves and placed in trays of iron. The firing is effected by two furnaces placed in the lower corners of a quadrangular casing which surrounds the cylinder, and the flues are so contrived that the heat has to pass from the lower corner of the casing to the upper and diagonally opposite corner.

DUBS, H., and J. EVANS. *Improvements in slide valves.* Dated Sept. 12, 1856. (No. 2136.)

This relates to several contrivances whereby the pressures on the back and face of the slide are balanced.

PATON, E., and C. F. WALSH. *Improvements in fire-arms and projectiles.* Dated Sept 12, 1856. (No. 2137.)

The grooves of rifles are formed with one side square, or radiating from the axis of the bore, and the other side is brought with a gradual curve to the inside of the bore. The ball is made with wings fitting this form of groove, and the twist is given to the grooves so that the ball will spin with the inclined side in advance of the square side. The resisting action of the air to the rotation of the ball is thus made small.

BROOMAN, R. A. *Improvements in treating and purifying water to be used in the washing and scouring of wool, and in other washing and cleansing operations.* (A communication.) Dated Sept. 12, 1856. (No. 2141.)

The invention consists in treating water containing lime by adding thereto caustic soda, or caustic potash, either alone or combined with unslacked lime; or refuse wash waters may be added to the water to be purified, as well as caustic soda or potash. The lime and calcareous impurities will be deposited.

VAUGHAN, J. S. *An improvement or improvements in the apparatus for making infusions of vegetable or other substances.* Dated Sept. 13, 1856. (No. 2146.)

The object here is to construct an apparatus for making infusions of tea or coffee which shall serve as a tea pot and tea urn combined.

BROOMAN, R. A. *Improvements in mills.* (A communication.) Dated Sept. 13, 1856. (No. 2148.)

This consists in casing the mill stones so that air can only enter through the eye of the upper stone, and in connecting therewith a fan or ventilator, whereby the air is

drawn through the centre or eye between the two stones, and out from the periphery thereof.

PROVISIONAL PROTECTIONS.

Dated March 6, 1857.

656. John King, of St. Swithin's-lane, London. Improvements in the manufacture of boots and shoes. A communication.

Dated March 9, 1857.

680. James Andrew Cumine, of Belfast, optician, and Colin Hunter, of Islandreagh, Antrim, bleacher. Improvements in electro-magnetic engines and batteries.

Dated March 31, 1857.

882. Jean Eugène D'Arcet, of Paris, chemist. Improvements in distilling and rectifying tar, resins, oils, turpentine, bitumen, and other matters, and in the apparatus for the same.

884. Henry Francis, of West Strand, engineer. Improvements in machinery for ploughing and working land.

886. George Hamilton, of Blackland-mill, Paisley, N.B., bleacher. Improvements in the treatment or finishing of woven fabrics.

888. Frank Clarke Hills, of Deptford, Kent, manufacturing chemist. Improvements in manufacturing gas, and in apparatus connected therewith.

890. Josiah Wright, of Hemel Hempstead, Herts, plait dyer and bleacher. An improved method of bleaching straw plait and straw. A communication.

892. William Glover, of Manchester, professor of music. Improvements in looms for weaving.

Dated April 1, 1857.

894. Robert Alfred Wright, of Batignolles, near Paris, civil engineer, and Louis Jules Fouché, of Paris, steam boiler maker. A new apparatus destined to produce chemical decompositions by means of superheated steam and water.

896. William Samuel Burton, of Oxford-street, merchant and manufacturer. A new or improved manufacture of rollers or cylinders for printing fabrics.

900. John Leslie, of Glasgow, merchant. Improvements in the treatment of wash waters containing soap, oils, saponified or saponifiable matters, for the obtainment of products therefrom. A communication.

902. William Smith, of Glasgow, manager. Improvements in the manufacture or production of ornamental fabrics.

904. Robert Wardell, of Stanwick, York. Certain improvements in reaping machines.

906. Henry Smith, of Stamford, Lincoln, agricultural implement maker. Improvements in chaff cutting machines.

908. John Crossley, of St. Helen's, Lancashire, glass manufacturer. Improvements in machinery for smoothing glass.

910. Robert Martin, of Cambridge-road, King's-cross, and Joseph Walter Sutton, of Lamb's Conduit-street, both in Middlesex. Improvements in the means of giving alarm in dwelling houses and other buildings in cases of robbery, fire, or other emergencies.

Dated April 17, 1857.

1089. Samuel Messenger, chandelier and general gas-fitting manufacturer, of Birmingham, and Hatton-garden, London, and Theodore Fletcher, also of Birmingham, superintendent. Certain improvements in gas burners.

1091. Gabriel Arthur, of Linares, Spain, civil engineer. Improvements in the manufacture or production of bricks, tiles, and other articles of earthenware.

Dated April 18, 1857.

1093. Hippolyte Duhamel, jun., of Clichy-la-Garenne, near Paris, glass manufacturer. Improvements in the fabrication of glass.

1095. John Wylie, of Edinburgh, pianoforte tuner. Improvements in pianofortes.

1097. George Davies, of Serle-street, Lincoln's-inn, civil engineer. Improvements in the method of laying under-ground telegraphic wires. A communication from M. S. Goddier and H. E. Goddier, of Paris.

1099. Henry Daniel Deane, of Pigott-street, East India-road, Limehouse, ship caulker. Improvements in the floats or paddle-boards of paddle-wheels.

1101. Henry Heald, of Sabden, Whalley, Lancaster, cotton manufacturer. An improved method of packing pickers employed in looms.

Dated April 20, 1857.

1105. Thomas Sanderson, of Lothian-road, Edinburgh, coach builder. Improvements in wheeled carriages.

1107. John Cowdery Martin, of Fern-cottage, Charlewood-road, Putney, Surrey, naval architect. An improvement in the manufacture of paper.

1109. William Thomson, of Dalkeith-gardens, Midlothian, N. B., gentleman. Improvements in stoves or heating apparatus.

1111. John Stephen Jarvis, of Wood-street, London, warehouseman. An improvement in the manufacture of stocks or ties for the neck.

1113. William Clay, of Liverpool, iron manufacturer. Improvements in the manufacture of iron and steel.

1115. Thomas Wright Gardener Treeby, of Westbourne-terrace Villas, Upper Westbourne-terrace, Paddington. Improvements on syphons and parts connected therewith.

Dated April 21, 1857.

1117. Benoit Amédée Fournier, of High Holborn, London. Preventing on railways those accidents that occur through one locomotive running into another.

1119. Amory Fairbanks Sherman, of Roxbury, Massachusetts, United States, civil engineer. Improvements in machinery for the manufacture of ropes, strands for ropes, and for other purposes.

1121. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improvements in rules and other measuring instruments. A communication from M. Siegrist, of Dornach, France.

1123. John Chanter and David Annan, of Bow, Middlesex. Improvements in furnaces when moveable fire bars are used.

1125. Daniel Colladon, of Rue de la Victoire, Paris, banker. Improvements in means and machinery for boring and cutting stone, earth, and other like substances, and for ventilating the places where such machinery is employed.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," May 5th,* 1857.)

3025. L. A. Lang. A new system of rotatory motion for all kind of vehicles.

3036. F. Prince. Improvements in fire-arms.

3053. G. A. G. Nani. Improvements in toys for the use of children.

3056. J. S. Barraclough. Improvements in the means, machinery, or apparatus used for grinding dye-wares.

3063. W. Smith and D. Bethune. Consuming or preventing smoke in chimnies and furnaces.

3064. A. J. B. L. de Marcescheau. Improvements in the modes of communicating or transmitting motion to propelling apparatus, engines, or machinery.

3067. F. W. Campin. The manufacture of a certain textile fabric which the inventor terms "tissu buffle." A communication.

3068. J. Clay. A new or improved portable printing or impressing instrument.

3070. H. H Goodman. Improvements in the construction of locks. A communication.

3076. G White. An improved poultice. A communication.

3083. J. C. Wagstaff. Improvements in the manufacture of felted cloth. Partly a communication.

3087. H. Vaughn. An improved method of hardening and tempering steel, and of hardening cast and wrought iron.

2. C. C. Reinhardt. An improvement in the manner of fastening metallic backs to truss pads of glass, porcelain, or other analogous substances.

7. F. H. Maberly. Improvements in the construction of wheeled carriages.

17. J. Wilson. Improvements in the manufacture of steel.

26. R. A. Brooman. Certain improvements in rotary steam engines. A communication.

27. R. A. Brooman. An improved steam engine. A communication.

28. L. W. Watkins. The manufacture of a composition commonly known as putty, to be used in glazing and other purposes.

30. W. E. Newton. Certain improvements in the means of connecting, accumulating, retaining, and applying reserved power for the application of railway brakes in sudden emergencies. A communication.

35. T. Forsyth. Improvements in locomotive and other steam engines.

39. F. Braithwaite. An improved mode of extracting the iron from tin ores.

57. C. F. Claus. Obtaining tin or compounds of tin from the scraps or clippings of tinned sheet iron.

68. J. Harris. An improved lock and method of acting upon lock-bolts, latches, taps, and valves, railway and other signals, bells, and other like apparatuses.

69. A. McDonald. Improvements in the manufacture of columns, pilasters, and other similar structures of granite, marble, porphyry, jasper, serpentine, sienite, and other stones, capable of receiving a high polish.

95. R. A. Brooman. Improvements in galvanic batteries, and in apparatus connected therewith. A communication.

121. D. H. Fowler. An improvement in steam boilers.

151. N. Fortune. Improvements in the manufacture of knife-handles.

182. S. Neville. Improvements in machinery or apparatus employed in the annealing of glass and the firing of pottery ware.

208. P. A. L. de Fontainemoreau. Certain improvements in fire-arms, and in the bullets to be used therewith. A communication.

532. A. Koch. Improvements in machinery for breaking and scutching flax, hemp, and other fibrous substances.

592. H. W. Tyler. Improvements in the permanent way of railways.

729. H. Bridges. Improvements in buffing, bearing, and draw-springs, and buffer-cases for railway purposes.

752. J. Withnall. Certain improvements in the manufacture of rollers or cylinders to be employed for printing calico and other surfaces.

783. J. Parker. Improvements in apparatuses for separating corn and other grain and seeds from dust, chaff, and other matters.

876. J. Scott. Improvements in bottles and their stoppering or closing details.

888. F. C. Hills. Improvements in manufacturing gas, and in apparatus connected therewith.

900. J. Leslie. Improvements in the treatment of wash waters containing soap, oils, saponified or saponifiable matters for the obtainment of products therefrom. A communication.

929. D. Joy. Improvements in steam engines.

1051. J. Rubery. Improvements in the manufacture of umbrella and parasol ribs.

1059. A. V. Newton. Improvements in carding engines. A communication.

1091. G. Arthur. Improvements in the manufacture or production of bricks, tiles, and other articles of earthenware.

1109. W. Thomson. Improvements in stoves or heating apparatus.

1125. D. Colladon. Improvements in means and machinery for boring and cutting stone, earth, and other like substances, and for ventilating the places where such machinery is employed.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

971. Edward Briggs and William Souter.
974. William Macfarlane.
975. James Fenton.
982. Alfred Trueman.
996. Moses Poole.
1006. Edwin Heseler.
1085. William Edward Newton.
1104. James Horsfall.

LIST OF SEALED PATENTS.

Sealed May 1, 1857.

2588. Joseph Jessop.
411. David Baker.
529. William Edward Newton.
559. Auguste Godet.
571. Walter Macfarlane.
591. James Edward McConnell.
647. Thomas Burstall.
663. Rowland Mason Ordish.
665. Josiah Parkes.

Sealed May 5, 1857.

2592. André Jacques Isaac de Montenay du Minhy.
2593. William Weild.
2610. George Henry Stevens and Robert Fitch.
2611. Joseph La Cabra.
2618. Frederic Chapman and Charles Bowyer.
2624. Amos Holt and Jabez Bentley.
2626. James Dickinson.
2630. William Gossage.
2631. Charles Vaughan, William James Vaughan, and Richard Vaughan.
2637. Richard Archibald Brooman.

2644. Peter Gaskell.
2658. John Patterson.
2684. Thomas Beatt Sharp and Joseph Anthony Collet.
2686. Richard Emery.
2696. Archibald Reid and Charles O'Neil.
2709. John Drew.
2738. Alfred Watson and Alfred Hamlyn Williams.
2808. Peter Armand le Comte de Fontainemoreau.
2894. William Hadfield Bowers.
2898. John Longbottom.
2914. John Browning.
2994. Vincent Louis Casimir Renou.
278. Isaac Holden.
280. Isaac Holden.
474. Robert Best.
487. James Crook.
548. William Wood.
582. Alfred Vincent Newton.
590. George Wilson.
604. Edwin Francis Jones.
624. William Edward Newton.
696. Nathan Appleton Dyar.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris. Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1762.] SATURDAY, MAY 16, 1857. [PRICE 3D

Edited by R. A. Brooman, 166, Fleet-street.

FENTON'S PATENT RAILWAY SIGNAL DETECTOR.

Fig. 1. Fig. 3.

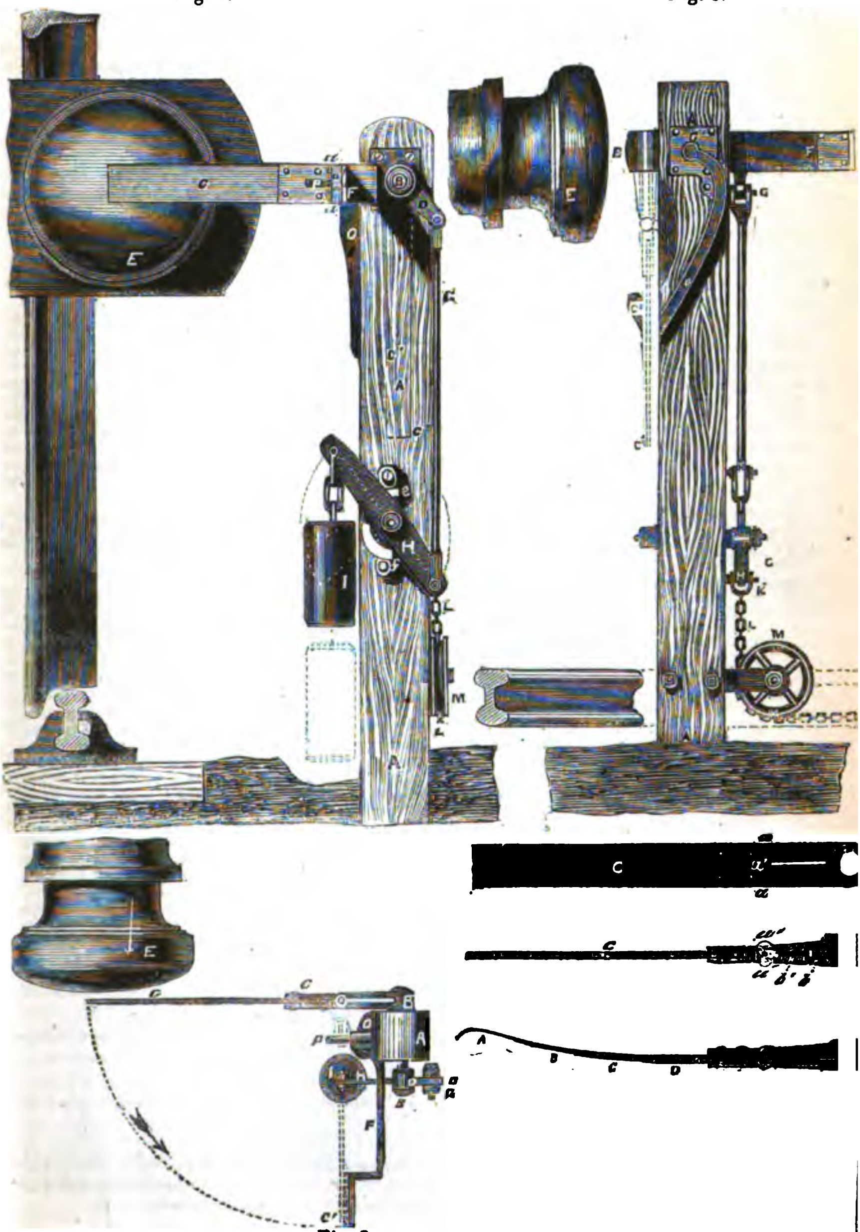


Fig. 2.

FENTON'S PATENT RAILWAY SIGNAL DETECTOR.

MR. FENTON, of the Low Moor Iron-works, a gentleman of very great practical experience in railway matters, has invented and brought into use an apparatus worked in conjunction with railway signals, and designed to act as a detector, by proving, in the event of an accident occurring, whether the warning signal was or was not set at the time of the passing of the train, and thus fixing the blame with certainty upon the culpable party—the engine driver or the signal-man, as the case may be. The invention consists in placing a supplementary signal or semaphore between the station signal and the distance signal, or beyond the latter, or beyond both. The supplementary signal is worked in connection with, and by the same handle as either the station or the distance signal, and is used for indicating whether the one or other of these signals was set at the time the engine passed it. It stands only as high as the buffer beam of the engine, and is placed near the rails, so that when an arm is thrown out therefrom to danger, the engine cannot pass without breaking it down. The arm is secured in a socket, and may be readily replaced when broken, at a small cost; or the arm may be pointed in such manner that instead of being broken, a portion of it may be turned out of its transverse position, and thus indicate the passage of the engine. The signal post will be inexpensive, as no lamp is required, and a short wire attached to that of the station or distance signal will work the supplementary arm. The additional signal post, when situated between the station and the distance signals, should be placed as far inside the latter as to allow an ordinary train to be protected by the distance signal when the train is pulled up short of the station. A thin glass phial, containing a coloured fluid (or other similar contrivance), may, if found necessary, be introduced into the end of the supplementary semaphore. This would be broken when the engine struck it, and the fluid be spattered over the buffer beam, more certainly insuring the detection of the culpable engine driver. When the signals are set at caution, it is necessary that the supplementary signal post and arm should be so arranged that the engine and train will pass clear of them.

Fig. 1, of the accompanying engravings, is a side elevation, fig. 2 a plan, and fig. 3 a front view of one of the improved supplementary or signal posts furnished with a jointed arm. Fig. 4 is a side view, and fig. 5 a plan, partly in section, of the arm detached. A is an upright post through which is passed the horizontal weigh shaft, B, which carries the jointed signal arm, C, at one end, and the crank arm, D, at the other. The arm, C, is jointed at *a*, so as to be capable of folding aside when struck by the buffer, E, of the engine, and a spring *b*, and bolt *b'*, shown in fig. 5, are fitted at the joint in such manner that the bolt *b'*, is pressed by the spring *b*, against one or other of the flattened surfaces *a' a' a'*, for the purpose of preventing the folding part of the arm, C, from being moved by the wind or other accidental cause from the position in which it is set, whether extended or folded. The folding part of the arm, C, is a thin plate of steel or iron riveted in a thicker portion. F is a horizontal rest fixed to the post, A, which rest receives the arm, C, against it, when the latter is driven aside by the buffer. The extremity of this rest is faced with a piece of vulcanised India rubber, *c*, to receive the blow of the arm, C. To the crank arm, D, is attached the connecting rod, G, the lower end of which is jointed by a pin to one end of the lever, H, the other end of which is furnished with a weight, I (supposed to be removed in fig. 3). The pin which connects the rod, G, with the lever, H, carries also a shackle, K, to which is connected a chain, L, which passes under the pulley, M, and has its other extremity connected to the wire which works the station or the distance signal, as the case may be. N is a guide piece attached to the post, A, and furnished with the stops *e*, *f*, to limit the motion of the lever H. O is a guide piece fixed to the front of the post A.

The action of the apparatus is as follows: supposing all the parts of the signal to occupy the positions shown in figs. 1, 2, and 3, and the buffer, E, of the engine to move in the direction indicated by the arrows in figs. 2 and 3, and to strike against the arm, C, this arm will thereby be turned into the position indicated by dotted lines, C' C', in figs. 2 and 3, coming against the rest, F; when the station or distance signal wire, and therefore the chain, L, is slackened, the weight, I, falls, and by means of the lever, H, raises the connecting rod, G, and thereby the shaft, B, is turned through a fourth of a revolution, carrying with it the arm, C, the folded portion of which slides down the guide piece, O, and is by it again extended or opened out into the position shown by the dotted lines, C', in figs. 1 and 3, ready to be again set. When the chain, L, is pulled from the station, the connecting rod, G, is pulled down, and the arm, C, is again extended, as shown in the drawings. In order to prevent the possibility of the engine driver or other person completely resetting the signal arm, after an accident had occurred, so as to make it appear that the signal arm had been set after his engine had passed it; a detector bolt, P, is placed in the upper part of the guide plate, O. This bolt is so fitted as to be wholly driven within the plate, O, by the arm, C, when the latter is struck by the engine, and is acted upon by a tooth upon the shaft, B, or by some other suitable contrivance, in such manner that after it has been driven wholly within the plate, O, it cannot be protruded again until the chain, L, is slackened from the station.

The patentee sometimes forms the jointed signal arm partly of a set of thin curved steel plates, A, B, C, D, arranged, as shown in the plan view, fig. 6. These plates will come successively into action when the front one, A, is struck by the buffer of the engine. An arm, constructed in this manner, will receive the blow of the buffer with less shock than the arm before described.

If thought desirable, the chain, L, figs. 1, 2, and 3, leading from the signal wire, may be connected to that extremity of the lever, H, upon which the weight is now hung, and the weight be transferred to the opposite end, so that the signal shall be set by slackening the chain, L. Other modifications of the details above mentioned may also be used without departing from the principle of the invention.

THE STEAM TRANSPORT "TRANSIT."

In the House of Commons, on Friday last, Mr. W. S. Lindsay, the Member for Tynemouth, repeated the statements which had been made in the newspapers respecting the above ship, and inquired of the Admiralty whether they were well or ill-founded.

Sir Charles Wood, the First Lord of the Admiralty, replied to Mr. Lindsay, in a speech which has proved completely effectual in removing every doubt as to the excellence of the *Transit*, and which has entirely confirmed the statements made in our last number. We cannot give the whole of the defence of the Right Hon. Bart., but the following is a condensed statement of his remarks. After alluding to the purchase of the three vessels, the *Transit*, *Perseverance*, and *Urgent*, from Messrs. Mare and Co., "builders of the highest possible character," he remarked that although the size of their poops had been increased, and the fore part of the vessels had been covered over so as to afford greater accommodation for the ship's company, to leave the whole decks clear for the accommodation of the troops, this was done with the lightest possible materials, and did not seriously add to the weight of the upper part of these ships. The *Transit*, instead of having the masts of a two-decker, or of a vessel of that tonnage, according to the Admiralty scale, had the same masts as were put into some 20-gun corvettes which had recently been built and sent to sea, and which were reported to be so stiff that the Admiralty were about to build another vessel of the same size and to give her an upper deck. The *Satellite* was one of these corvettes, and the masts of the *Transit* were similar to those of the *Satellite*. The burden of the *Satellite* was 1,460 tons, that of the *Transit* 2,580 tons; the length of the *Satellite* was 200 feet, that of the *Transit* 300 feet; the beam of the *Satellite*, 40 feet 4 ins., that of the *Transit* 41 feet 6 ins. Therefore, so far from having the masts and yards of a vessel larger than herself, the *Transit* was rigged according to the scale of a vessel 100 feet shorter and 1,120 tons less than herself. The whole weight of the upper works of the *Transit* was 62 tons; that of the guns and shot carried on the upper deck of the *Satellite*, 84 tons. The area of the sails intended to be given to the *Transit* by her builders was 18,800 square feet; the area of those which she actually carried was only 16,400. The result of all these calculations was that the stability of the *Transit*, as compared with that of the *Satellite* and her sister corvettes, was as three to two. These vessels were not built for troop ships, but, so far from having spoiled them by the alterations which they had made in them, the Admiralty had very considerably undermasted them. They were built for carrying cargoes which would be put low into the ships, and would be carried during the whole of the voyage; therefore, when they came to be used as troopships, it was necessary to put ballast into them to counteract the lightness of troops as compared with deadweight cargo, and to provide against the results of the consumption of water and provisions on the voyage. Into none of them, however, was there put so much ballast as to sink them below the point intended by the builders to be their water-line. In the case of the *Transit*, the Admiralty were not satisfied with the calculations alone, but made experiments upon her at Sheerness, both with troops and with deadweight, the effect of which was entirely to confirm their result. A few hours before he (Sir Charles) came down to the House, he had had put into his hands the *Mechanics' Magazine*, containing an article upon the *Transit*, evidently written by a person very competent to pronounce an opinion upon the subject, and in that article there was the following passage:

"If we express in numbers the ratios of the moment of stability to the moment of the sails—which is the measure of the stiffness of the ship under canvas — then, while the *Pearl* and the *Satellite* are each represented by the number 54, the *Transit* will be represented by the number 69. This is when the vessels are light. When they are deep the numbers are—*Pearl* and *Satellite* each 84, and *Transit* 119. The relative stiffnesses under steam alone are, when light, *Pearl* and *Satellite* each 53, *Transit* 67; when heavy, *Pearl* and *Satellite* each 82, *Transit* 116. As a further evidence of the stiffness of the *Transit*, we may compare her stability with that of the *Adventure* (formerly the *Resolute*), which was justly praised in the *Times* of Tuesday, May 6, by Mr. J. Laird, of Birkenhead, who built her. These ships are of about the same size, the displacement or weights differing only by 3 tons—that of the *Transit* being 2,751 tons, and that of the *Adventure* 2,749 tons. The stability of each of these ships was estimated approximately; the decks, engines, masting gear, equal weights of ballast, &c., being taken into account; and while the stability of the *Adventure* was found to be 5,130 tons, that of the *Transit* was no less than 8,484 tons."

He hoped, therefore, that the House would be satisfied that, both by calculation and by

experiment, the *Transit* had been proved to be as steady a vessel as could be sent to sea. The experiments of which he had spoken were tried after the poop and forecastle were put on, and therefore showed the quality of the vessel, not as she was when she was purchased, but as she was at the present time.

Attacks like those recently made were very amusing, because they seemed to imply that it was only Government vessels that suffered from bad weather, but a circumstance had come to his knowledge which showed that other vessels suffered also. At the very time the *Urgent* went to sea a fine merchant ship did so likewise, and, encountering the same gale, was not injured slightly, like the *Urgent*, but was driven back dismantled. As regarded the *Transit*, her engines had, as he had already stated, been originally built for the Russian government, and he would frankly admit that they had turned out ill, and had broken down; but all the accidents which had occurred were to be attributed to the engines, and not to the ship itself. During the war the necessity for the services of the vessel was so great that it was found impossible to lay her by and put in new engines, and all that could be done was to repair the existing engines as well as possible, but at the close of the war they had been taken out and new ones substituted for them, and the ship at the present moment was perfectly ready to go to sea. With regard to the particular accident to which reference had been made, he would inform the House how it occurred. The ship left Portsmouth and proceeding to the Needles encountered a thick fog, and the commander knowing that there was a large number of merchant vessels about, determined to anchor. He did so, and in the course of the night, the tide having changed, the ship drifted over the anchor, which upon being raised was found to have had its stock broken, and no doubt the hole in the bottom of the ship had been caused by the vessel striking the anchor-stock. The conduct of the captain was, no doubt, exceedingly negligent, and the court of inquiry had not, as had been stated in the newspapers, acquitted him of all blame, but, on the contrary, had ordered him to be reprimanded, and he had been reprimanded most severely.

Now, with regard to the *Transit* having put into Corunna, the honourable gentleman had referred to a letter describing the dangers which the ship incurred in the Bay of Biscay. He did not know whether the gentleman who wrote that letter was suffering from that depression of spirits which sometimes displayed itself on board ship in those not accustomed to the sea, and therefore took a gloomy view of matters; but he (Sir Charles) could only say he had received a very different account. He then read to the House a letter which he had received from a friend of his, whose brother was in command of the troops on board the *Transit*, in which it was stated that the *Transit* had to encounter a four days' gale in the Bay of Biscay, the wind blowing right in their teeth; that they shipped a good deal of water (no mention of any leak), and that their foremast rigging having got loosened, they put into Corunna in order to get it put to rights, and expected to be off again the following morning. He spoke in high terms of the general arrangements for the comfort of the troops. The whole letter was written in the best spirits, and certainly conveyed no idea of any misgivings as to the safe arrival of the *Transit*. It was by no means an unusual thing for the rigging of a newly-rigged ship to stretch, and the rigging of the *Transit* had no doubt stretched and required to be set up. He (Sir Charles) had been told by a naval officer an instance of a ship which, after having been at Portsmouth ten months, went across the Bay of Biscay, and in that case the rigging was so stretched that it was necessary to set it up. He would read an extract from the report of the sailing qualities of the ship *Transit*, dated the 22nd of August, 1856, signed by the commander, master, and the carpenter:—

"Does she ride easy at anchor?—Yes, so far as tried.

"Does she roll easy or uneasy in the trough of the sea?—Deep, but easy.

"Does she pitch easy?—Yes.

"Is she, generally speaking, an easy or uneasy ship?—Easy."

That statement would, he thought, serve to show the House that the *Transit* had been tried in every possible way. He might add, that there was now no complaint made with respect to her engines. He trusted he had now satisfied the House upon the subject, and would venture to express a hope that what had fallen from the honourable gentleman the member for Tynemouth would induce the observance of more caution and more forbearance in laying such letters as they have heard read before the public. He should not, of course, in the slightest degree complain of any attacks which might be made upon the Board of Admiralty. It was but natural that they should expect to be found fault with; but such statements as had been put forward were cruel to the relatives of those whose safety was connected with the seaworthiness of a particular vessel, while they were not calculated to effect any good whatever.

ON THE APPLICATION OF HEAT TO DOMESTIC PURPOSES, AND TO MILITARY COOKERY.

At a recent Friday evening meeting of the Royal Institution, Captain Grant, late R.A., gave a lecture on the above subject. The following is an abstract of the discourse:

Domestic fire-places.—The universal practice of fixing grates, and surrounding them with masonry, is defective in principle; for the masonry not only absorbs a large portion of the heat which is required to warm the room, but throws a still larger portion up the chimney.

The heat which is thrown out from grates set in this manner does not depend so much upon the quantity of fuel they contain, as upon the amount of radiating and reflecting surfaces with which that fuel is surrounded. The highly polished steel surfaces which adorn the grates of those who can afford them reflect and radiate a very large amount of heat in proportion to the fuel they contain; but as the mass of the people can ill afford this costly mode of obtaining heat, the object should be to secure the maximum of heat with the minimum of cost.

The detached or portable grate, similar to the Brussels stove, will secure these advantages; and, if properly constructed, combines all that can be desired for a domestic fire-place. It presents an open cheerful fire, easy to regulate—affords a large radiating surface—facilitates the operation of sweeping the chimney—and is the best security against a smoky one; consequently dispenses with those countless varieties of infallible curatives, called chimney tops, which so disfigure all our houses. It acts also as a hot-air stove.

Domestic cooking apparatus.—The objection to casing our domestic grates with masonry applies still stronger to cooking ranges, for the wasteful expenditure of fuel is most apparent in all our cooking arrangements. The remedy here is equally simple, by the substitution of a detached cooking apparatus placed in the same recess which receives the ordinary fixed kitchen range; and a portable kitchen stove of this construction may be seen in daily operation at that interesting establishment, the North-west Reformatory Institution, in the New-road, where they are manufactured by the inmates. Eighty-two persons are daily cooked for at a cost of sixpence per day.

It may not be out of place to suggest to those who take an interest in the reformatory movement, a visit to that establishment, and see what has been accomplished through the exertions of one man (Mr. Bowyer), one of the most useful self-sacrificing philanthropists of the day."

The cottager's stove.—There is a large and important class of persons among the industrious and working classes, and also the indigent poor, whose domestic wants demand our consideration. For the purpose of at the same time warming their dwellings and cooking their food in a simple and economical manner, "The cottager's stove" was designed, which has found its way to every quarter of the globe. It requires no fixing, is extremely simple in its construction, and all the operations of cooking may be carried on with any description of fuel. The fact of 100 lbs. of meat and 115 lbs. of vegetables having been cooked in one of these stoves, with less than 20 lbs. of coal, will suffice to prove how economically it may be worked, and it is peculiarly well suited to the rural districts. These stoves are manufactured by the Messrs. Bailey, of High Holborn.

Military cookery.—The events of the late war have given rise to a variety of inventions and improvements, and amongst them that of cooking for large masses of troops, with convenience and economy, has been under consideration.

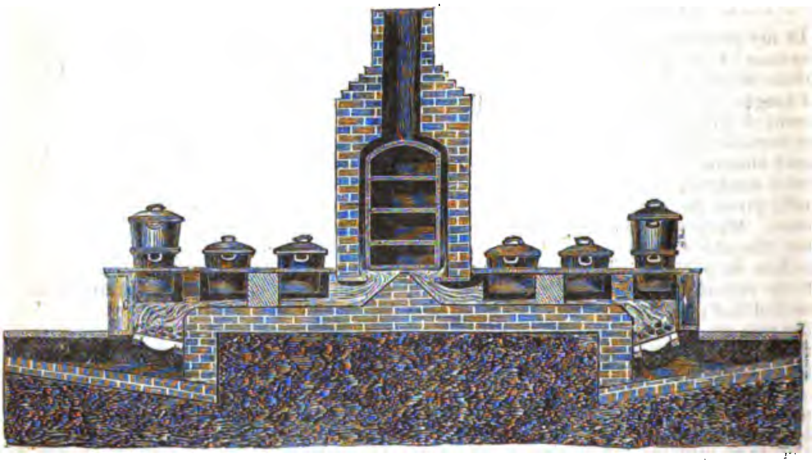
Field cooking.—A system of field cooking was introduced at Aldershott, at the lecturer's suggestion, by cutting a trench in the ground and covering it with thin iron plates having a central hole in each to receive the ordinary camp kettle. A chimney is formed of sods, piled up to the height of three feet at one end of the trench, and a fire made at the other, and by this simple arrangement several regiments cooked for some months.

Battalion cooking apparatus for troops, adopted at Aldershott.—This principle of cooking was subsequently adapted by Captain Grant to the requirements of the troops in the hut barracks at Aldershott, and extended to the battalion cooking kitchens throughout the whole of that encampment, where it has continued in successful operation for the service of between 12,000 and 14,000 men, for these last twenty months.* From April to August in the last year, it was subjected to the severe test of cooking for 92,000 men, who marched in and out of the encampment during that period. The consumption of fuel requisite for this system of cooking is one half-pound of coal per man per day, and the official report states the cost to be one halfpenny per man per week for the three daily meals.

Battalion cooking apparatus for permanent barracks, with oven.—The soldier's cooking

* See *Mechanics' Magazine*, vol. lxiii., p. 537.

is confined to the boiling process; and as he can only obtain a change by availing himself of a public bakehouse at his own cost, an oven has been introduced into the chimney of the apparatus, as shown in the accompanying engraving, and so con-



structed that it is surrounded by the heated products of the two flues; thus profiting by what in ordinary cases is wasted up the chimney. 560° of heat were obtained by this arrangement in an oven capable of baking 250 lbs. of meat, without any additional consumption of fuel.* The principal feature of Captain Grant's cooking arrangements is illustrated in the cut, but the number of kettles is there reduced for the convenience of engraving.

By the introduction of this oven, other improvements are effected; the flues are shortened, the fires brought nearer together, and the whole of the kettles boil simultaneously. The advantages of this system of cooking could only have been obtained by the application of the principle of horizontal draft; and the same principle may be carried out with equal advantage for warming the dwellings of the working classes. The subject is worthy the consideration of those interested in the philanthropic undertaking of erecting blocks of dwellings for our houseless poor. This principle will also be found applicable in many cases, where the perpendicular shaft is adopted in our large factories, pouring out its column of fire and wasted heat.

An apparatus, upon the principle of cooking for troops in permanent barracks, has lately been erected at the North-west Reformatory Institution, in the New-road, for the use of its inmates, which combines the means of cooking, baking, washing, drying the linen, and supplying hot water for baths. It might be extended with advantage to our prisons, unions, and all large establishments requiring such conveniences.

Public bakehouses might also avail themselves of this principle. By the aid of two small fires, heating the oven from without, and lining the interior with brick or tile, the baking might be carried on with some advantages over the present system.

* This principle of military cooking admits of so much variation in its details, that it may be adapted to all the requirements of an army, either in the field or in permanent barracks, from a single soldier to a battalion of a thousand strong, for which provision is made.

The battalion cooking apparatus is constructed for that number of men, who may be efficiently cooked for by the aid of two small fires of 18 inches square and 6 inches deep, with any description of fuel, if the principle is properly carried out.

A school for the instruction of cooking might be added with advantage to the many excellent ones already established for the improvement and comfort of the British soldier.

ON ALGEBRAICAL EQUATIONS.

EASIER RULES AND DEMONSTRATIONS FOR QUADRATICS AND BINOMIAL SURD-SQUARES. BY H. FRASER HALLE, LL.D.

In my previous papers in the *Mechanics' Magazine* I have removed some of the stubble which obstructs the progress of the self-taught in popular treatises. In the present I propose to clear up, by a very easy demonstration, all that may have appeared obscure to Society of Arts and Civil Service candidates and others in the reasons usually given for particular quadratic operations. Many of these forms of proof rather disguise than reveal the governing principle on which the operations depend, and by means of which they should be classified and remembered.

The evolution of the roots of quadratics and of binomial surd-squares is governed by the same principle, and that a very simple one, viz., half the sum of two numbers, *plus* or *minus* half their difference, equals the greater in the first case, and the less in the second.

Now in demonstrations relating to quadratic rules this principle is nowhere broadly stated; and if it does ever appear during any of the usual algebraic mystification, it is rather as a vulgar component than as the fundamental principle.

To obtain an exact idea of a quadratic equation, we must observe that we have in its second member, the absolute term, merely a multiple of some unknown number. Thus, in this first form,

$$x^2+3\,x=54, \text{ or } 6\times 6+3\times 6=9\times 6,$$

the absolute 54 is, we see, merely a particular multiple of 6, that is, 6 taken 6 times + 3 times; and every quadratic absolute consists of x taken x times $+\,a$ times, or $(x+a)\,x$. In many cases, therefore, we might readily obtain the value of x by subtracting a trial-product from the absolute term, or by adding one to it, as in this second form

$$x^2-8\,x=-15.$$

Here if we take 5 as a trial value and add 8×5, $40-15=25$, or the square of the trial number, which shows that 5 is an exact value of x; for

$$8\,x-15=x^2.$$

If we had taken 4 we should have obtained a number greater than the square of 4, indicating that our trial-value must be a higher number, &c.

But there is a ready means of obtaining the exact value of x without resorting to the way of experiment. The absolute term of every quadratic is a product, the sum or difference of whose factors is the coefficient of the second term. In the first form 3 is the difference of the factors 9 and 6; in the second form 8 is the sum of the factors 5 and 3. These factors are called the positive and negative roots of the equation, and the coefficient *with a contrary sign* is always their algebraic sum. The absolute with a contrary sign is their product. Thus $-3=6-9$. Either of the roots is an exact value of x. For

$$81+3(-9)=54,$$

and, generally, if p and q represent the two values of x,

$$p^2+a\,p=b$$

will be the positive expression, and

$$q^2-a\,q=b$$

the negative. In the second form it is evident that both roots are positive.

The coefficient 3, then, being the *difference* of the factors, all that we need, in order to solve this form of quadratic, is the *sum* of the factors. This we can readily obtain by means of the absolute or product. Let $a-b$ represent 3 and $a\,b$ 54

$$(a-b)^2=a^2-2\,a\,b+b^2.$$

By adding to this square $4\,a\,b$, we have

$$a^2+2\,ab+b^2,$$

the square root of which is the *sum* required. Again; for the second form, where $-a\,b$ is the absolute, we need the difference of the factors. In this case also we add 4 times the absolute or $-4\,a\,b$ to the square of the coefficient. Our rule then for either case will be. *Add four times the absolute term to the square of the coefficient of the second, and take the square root of this sum. Half this result added to half the coefficient will give the greater root. The difference of the same quantities will be the less.*

Ex. 1st. $x^2+3\,x=54$

$$\surd(4\times 54+9)=15\ \therefore\ \frac{15}{2}+\frac{3}{2}=9,$$

$$\text{and } \frac{15}{2}-\frac{3}{2}=6.$$

Ex. 2nd. $x^2-8\,x=-15$

$$\surd(4\times -15+64)=2\ \therefore\ \frac{2}{2}+\frac{8}{2}=5,$$

$$\text{and } \frac{8}{2}-\frac{2}{2}=3.$$

Ex. 3rd. $x^2-8\,x=-16$

$$\surd(4\times -16+64)=0\ \therefore\ \frac{8}{2}+0=4,$$

the value of both roots.

Ex. 4th. $2\,x^4-x^2=3$.

Here, to avoid the ordinary fractional work, we multiply the absolute by the first coefficient (2) and omit the latter.

Then,

$$x^4-x^2=6,$$

and

$$\therefore\ \sqrt{(4\times6+1)}=5,$$

$$\therefore\ \frac{5}{2}+\frac{1}{2}=\frac{6}{2}$$

$$\text{and } \frac{5}{2}-\frac{1}{2}=\frac{4}{2},$$

but by doubling the absolute we doubled the roots.

$$\therefore x^2=\frac{6}{4} \text{ or } -\frac{4}{4},$$

$$\text{and } x=\sqrt{\frac{3}{2}} \text{ and } \sqrt{-1}.$$

The principle on which the removal of a first coefficient is founded, will be best illustrated by a numeral demonstration.

$$\text{Let } 2x^2+4x=30$$

where $x=3$. If we multiply every term by 2 we get

$$(2\times3)(3\times2)+4(3\times2)=10\times(3\times2)$$

from which it is plain that, though the first coefficient appeared to be struck out, it was incorporated to form a new value for x. In like manner quadratics may be sometimes reduced. Take our first example

$$x^2+3x=54$$

By dividing the absolute by the square of 3 (the common measure of the 2nd and 3rd terms), and the coefficient by the square root, we get $x^2+x=6$, the roots of which are 3 and 2; three times less than the originals. In this case every factor was divided by 3; for x was equal to 6; which any one may verify for himself.

In what we shall call double quadratics of this form

$$(x^2-ax)^2+p(x^2-ax)=q,$$

the first operation of course gives the value of x^2-ax, and the second that of x.

All the fractional work of the form

$$7\sqrt{x}+\sqrt[4]{x}=116,$$

given in Hind's Algebra, may be easily avoided, by multiplying the absolute by 7, as in example 4. Here the roots will be 28 and -29; but, as the absolute would be seventupled, x will equal

$$\left(\frac{28}{7}\right)^4=256 \text{ or } \left(\frac{-29}{7}\right)^4.$$

To solve the form

$$x^2+\frac{10x}{3}=19 \text{ (\textit{Colenso})}$$

multiply the absolute 19 by the square of the denominator 3. The reason is obvious.

In these last examples the difference of the results will give the positive and their sum the negative roots. And so in most cases.

Ex. 5th. $x^2-\sqrt{-3}(x)=-6$ (Nicholson and Rowbotham). Dividing the co-efficient by the common measure, $\sqrt{-3}$, and the absolute by its square, -3, we get $x^2-x=+2 \therefore \sqrt{(8+1)}=3$

$$\therefore\ \frac{3}{2}+\frac{1}{2}=2 \text{ and } \frac{3}{2}-\frac{1}{2}=1.$$

But we divided the factors by $\sqrt{-3}$, therefore the positive root will be $2\sqrt{-3}$, and the negative $-(1\sqrt{-3})$ or $-\sqrt{-3}$.

These writers use a geometrical series for reducing quadratic equations and striking out first co-efficients. The method I have employed for the same object, is the same in effect; but the very simple demonstration I have supplied shows that the use of a series is an extravagance. It was an oversight on their part not to apply the series for the reduction of the above example.

BINOMIAL SURD-SQUARES.

The rule for the extraction of the root of a binomial surd-square is governed by the same principle, and therefore belongs to the same class of operations as the rule for quadratics. That this is not plainly stated in popular treatises, written expressly for the benefit of the self-taught, any one may soon convince himself: and thereby learn the unconsciousness of the writers as to the utility of a scientific method. Isolated proofs are soon forgotten; but the classified are colligated by the law of association. To render the remembrance as well as the apprehension of the algebraic proofs still more difficult, the facts are obscured by mechanical forms and symbols, wholly unfamiliar to the learner, and too familiar, in some cases, to the more technical writer. We were once shown a very ordinary arithmetical principle out of its usual fetters, as a novelty, namely, when the difference of two numbers is unity, the difference of their squares is equal to their sum. Doubtless, but few would immediately recognize the familiar form in this its unusual dress. Fewer still of this technical class have noted that the difference of the squares is equal to twice the sum, when the difference is 2, and so on to the full perception of all the facts of this series. Let the reader turn to note C, in Bell's "Algebra," Vol. ii., and ask himself, whether the facts there stated are presented in a form suited to any but those who do not want them, namely, those who know them.

In the binomial surd-square,

$$7\pm2\sqrt{10} \text{ (\textit{Colenso})}$$

the first term is the sum of the squares, and the second the bi-product. All that we need here then is the difference of the

squares: and this can be obtained in the same way as we obtained our former difference. By squaring the sum $(a^2 + b^2)$ we shall get

$$a^4 + 2\ a^2\ b^2 + b^4$$

and by adding to this square four times the bi-product, sign *minus* $(- 4\,a^2\,b^2)$ we shall have

$$a^4 - 2a^2\,b^2 + b^4,$$

the square of the difference, the root of which $(a^2 - b^2)$ is the difference sought. But the square of a bi-product is equal to $4\,a^2\,b^2$. Therefore, our general rule will be—*Subtract the square of the second term from the square of the first and take the square root of this difference. Half the result added to half the first term will give the greater square, and subtracted, the less square.*

Thus, for the above form,

$$\sqrt{(49 - 40)} = 3 \therefore \frac{7}{3} + \frac{3}{2} = 5$$

the greater square, and

$$\frac{7}{2} - \frac{3}{2} = 2$$

the less square.

$$\therefore \sqrt{5} \pm \sqrt{2}$$

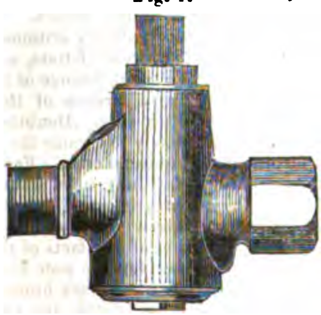
is the root sought.

South Lambeth, April 15, 1857.

HALE'S IMPROVED TAP OR COCK.

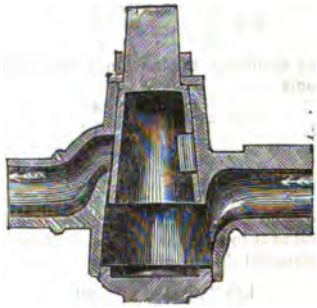
Mr. T. F. Hale, of the firm of Thomas Hale and Sons, founders, of Bristol, has obtained provisional protection for an improvement which consists in constructing taps or cocks as represented in the accompanying

Fig. 1.



engravings, of which fig. 1 is an external view, and fig. 2 a transverse section. The tap is formed with a conical barrel, *a*, of which the base or widest part forms the bottom of the tap, and with a hollow conical plug, *b*, ground to fit the barrel, *a*. The plug, *b*, has only one aperture, *c*, for the admission and outlet of fluid. The top, *d*, of the plug, *b*, is solid. In these taps the greater the pressure of the fluid passed through them, the tighter will they become; and in the case of steam or other heated fluid the tap will not be liable to any sudden change of temperature, as the plugs,

Fig. 2.



being always charged with the hot fluid, will keep the temperature uniform. To pass steam or other fluid through the tap, the aperture, *c*, in the hollow plug being opposite to the inlet, the plug requires to be turned entirely round, supposing the inlet and outlet pipes to be opposite to each other.

ENGINEERS' CLASSES AT THE BLACKBURN INSTITUTION.

A number of the members of the Blackburn Literary, Scientific, and Mechanics' Institution, being practical engineers who are desirous of studying the science of their profession, the directors have, with the concurrence of the board, formed a class for the prosecution of this desirable object. We are informed, however, that, having due regard to the wants of other departments, the general funds of the Institution do not admit of any adequate provision being now made for the purposes of this important class. Hence an appeal has been made to all interested in mechanical pursuits to contribute funds specially for its effective organization and progress hereafter. The directors desire it to be understood that the amount resulting from this appeal will be expended under the joint supervision and control of the General Board and the Engineers' Class Committee, and also, that all the property acquired thereby becomes permanently vested in the Institution, for the general use and benefit of all members. Contributions in answer to the appeal are received by Robert Hopwood Hutchinson, and Thomas Ainsworth, jun., Hon. Secs. Sir Robert Peel has munificently contributed 50*l*., and other subscriptions and gifts of models, &c., have been presented. We hope the engineers of Blackburn will be liberally aided in their honourable effort.

SCHÄFER'S PATENT STANDARD TRAVELLING BAG.

Messrs. P. and F. Schafer, of 12, Brewer-street, Golden-square, London, whose patent travelling bags are well known and extensively used, have patented and are manufacturing a "Patent Standard Bag" in which are comprised all the various improvements that have suggested themselves to the patentees in their long experience as makers of such articles. The accompanying engravings will show better than a written description the nature of the new bag. It is similar in appearance, and is opened in the same manner as the "wide-opening barred bag" of the patentees, by the use of their registered sliding-nozzle double-action lock; it then presents the whole of the fittings standing erect in the centre, as in fig. 1, leaving the sides free. By a simple contrivance, the bag is further made to open to the bottom, as in fig. 2. On two boards or standards are displayed the fittings; the boards, being supplied with a long hinge and a handle, may be lifted out of the bag, and made to stand firmly on a table, as in fig. 3; the sides then lying flat are in a convenient position for packing. The inner parts of the sides are provided with strong flaps, made of the best leather, or of watered silk, and also strong elastics and fasteners to confine any articles packed under them. One side of the bag can be opened to the bottom, leaving the other side still upright. The bag can be used without the fittings—the whole of the interior being then available for packing besides the flaps. It is also supplied with a new patent handle, the ends of which slide in grooves, thereby allowing the handle to lie quite flat on the top of the frame. The patent standard bag is, certainly, the most perfect travelling bag that we are acquainted with.

Fig. 1.

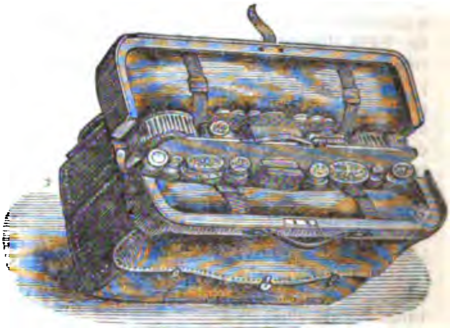


Fig. 2.

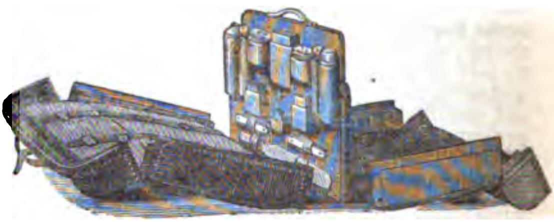


Fig. 3.

FATAL ACCIDENT TO AN INVENTOR.

We have to announce, with regret, that Mr. Joseph Taylor, engineer—who was associated with C. D. Cranstoun, Esq., in the invention of the admirable "coupling apparatus," which has been described and recommended in our pages—has met with his death on the Morayshire Railway. One of the engines on the line had been undergoing a thorough overhaul and repair; and Mr. Taylor, the company's engineer, with the view of trying the engine before putting her regularly to work, resolved on a trial trip to Lossiemouth. Accordingly, about half-an-hour after the 4·15 train left the Elgin station, and when in ordinary circumstances the line would have been clear, this trip was made, Mr. Taylor himself being engine-driver; but unfortunately the engine of the 4·15 train, after depositing passengers, goods, and carriages at the Lossiemouth station, returned with a waggon to take up ballast at the Drainie cutting, and was in the curve near the Oakenhead Bridge, when the trial engine came up at ordinary speed, and dashed on the ballast waggon. Owing to the curve at this part of the line, the party with the ballast waggon did not see the approaching engine till within a few yards, and it was impossible to avoid the collision. The ballast waggon was in front of the regular train engine, and the trial one from Elgin came against it with such force that the waggon actually rose up on end and fell over the tender of the engine, crushing Mr. Taylor, and seriously injuring a lad and others. Mr. Taylor was highly respected both for his character and his abilities.

ROYAL NAVY TONNAGE.

To the Editor of the Mechanics' Magazine.

SIR,—After a discussion conducted by various parties, and extending over many months, respecting further methods of admeasuring ships in the merchant service for light displacement, load displacement, internal capacity, and for adequate steam power, it seems at last to have become mutually agreed that it is inexpedient to encumber legislation and commerce with additional compulsory rules beyond those at present in force. But at the same time, it is, on all hands, conceded that it is still desirable to collect statistical information from private and voluntary sources upon these subjects for the promotion of science.

Relinquishing the merchant service, if attention is turned to the Royal Navy, we immediately observe a very different field, and one which I shall contend admits readily of the regulations just declined in the other case. First, because all the ships in the Royal Navy are built under one authority; second, they are designed chiefly by men of science, whose business almost exclusively is to attend to their properties and qualifications; and thirdly, the actual performances, qualities, speed, and capacity of the ships are regularly registered at the Admiralty, and are very generally known to the public. These are great and important advantages towards the collection of the desired materials, but, unfortunately, at present, it happens that there is in use in the Royal Navy, a system of admeasurement for tonnage, which, at the present day, is erroneous to a pitch of ridicule, and though the fact of its fallaciousness is well known, the method is still adhered to, practised, and quoted in calculations every hour, owing to the inveteracy of habit, and to the want of a better plan, ready for use. Hence, much of the argumentation about the properties of British ships during the last momentous generation, falls in part to the ground, because of its being based on this delusive rule. I refer to the old method of ascertaining tonnage, which was founded in 1733, and which consists of little more or less than multiplying the net length of the vessel by half of the square of the breadth. In this interesting formula (which proposes to determine the cubical contents of what may be called a parallelopipedon, by taking only the length and the breadth) the depth is quite disregarded, with the exception of a happy additional arrangement which insures that the *greater* it be, so much the *less* in inverse proportion, shall be the total computed result in tonnage!

Nevertheless, I am quite ready to admit (being one of those who fancy that our ancestors were possessed of some reasoning faculties) that this curious rule enjoyed a certain degree of random accuracy at the time when it was first established. It is very probable that when nearly all ships were built on the same type, that of the commodious *Haystack*, this rule was found sufficient for its purpose; but now-a-days, when a most extended variety of formation prevails, from the yacht to the frigate, the Indiaman, the steamer, and the three decker, it has become totally out of date. And after making every allowance, it really strikes one as remarkable, that so worn-out and antiquated a formula should still be allowed to keep its prominent place in the annals of the first navy in the world, when progress in science is being everywhere so widely and astonishingly diffused. It reflects but a dubious credit on the many learned and scientific gentlemen connected with Her Majesty's navy, that they have not yet established a more correct plan of ascertaining tonnage. True, various schemes have from time to time been started; but these sparks have expired as quickly as they were kindled, and left us still unenlightened. The merchants of this country, on the other hand, far outstripping the Admiralty, have been so convinced of the incorrectness of the old method, and the advantages of a precise one, that twice within the last thirty years have they procured Acts to be passed for its regulation; first about 1830, when a plan was instituted for measuring the exact interval space of ships' holds, with laborious minuteness; and second, in 1854, when a more simple, but still correct, plan for the same purpose was established instead.

By the old system, still in use under the Admiralty, of course no comparisons can fairly be struck between ships, nor any useful deductions be drawn; its fallacy is too well known to need much exposure. But it may be as well to give a few instances, which I can supply partly from mere memory, and partly from the materials most ready to hand. The late 12-gun brigs of 1845, by this charming rule, measured about 485 tons; that is, they might be supposed capable of carrying or stowing away that load; but what was the fact? they could not carry more than about 225 tons, or little above half the nominal tonnage. The modern 50-gun sailing frigates, *Raleigh*, *Phæton*, &c., measured about 2,000 tons; but, in fact, they can carry some 1,100 tons only, and their load displacement or ship and cargo altogether is but 2,500 tons. An old 74 measures only 1,750 tons, although really a larger vessel than the frigates, and carrying 300 tons more weight. Taking steamers, we find the *Arrogant*, of

1,870 tons, carrying 1,200; and the *Terrible*, of nearly the same nominal tonnage, carrying 1,700 tons. The *Vanguard*, 80, measures nearly 2,600 tons, and, in fact, carries about 1,400 tons; while the *Canopus*, 84, a vessel of very closely, indeed the same class and total size, though of different form, measures 2,250 tons, carrying also about 1,400. A two-decker measures the same as a three-decker, as in the case of the *Rodney*, 92, and *Trafalgar*, 120, though the latter was built to carry more by 200 tons, and has a total weight of ship and cargo of 400 tons more. Thus, whether taking large or small, there is constantly the same result of exaggerated error; and one begins at last to have the same idea of the tonnage formula that Junius entertained of a certain public character—that of never being right, not even by accident!

In this letter, intended for the mere purpose of setting the subject well afloat, it is not for me to attempt enforcing any hobby of my own. I do not even wish to define whether, by a new plan of "tonnage," I mean the computation of the load displacement, the light displacement, or the internal cubical space; or all of these. I desire only to show the benefit, and at the same time the palpable ease, of instituting in the Royal Navy, for the advancement of science and improvement of British shipping generally, some correct mode of determining a criterion of a vessel's size, quality, or character; such as may be used as a trustworthy means of comparison and investigation. I am, Sir, yours, &c.,

CRESCENS.

ON THE REINTRODUCTION OF ARMS OF DEFENCE INTO MODERN ARMIES.

"And if it should tend to save the life of only one man during a whole campaign, we must retain it by all means."—FREDERIC THE GREAT.

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A shield, in order to be bullet-proof (even against Minié bullets) ought to consist of several substances; *soft* substances in front, to break the force of the shot, and to lessen the force of the shock when the bullet strikes the shield; and behind them *harder* substances, to check the further progress of the bullet altogether. It is well known how *wool* (cloth, &c.), leather (hard and soft), wood, cork, gutta percha, &c., tend to break the force of projectiles, and how *sheet-iron* of sufficient thickness effectually checks its progress: and for the purpose of constructing a bullet-proof shield, the above-mentioned substances should be so combined that the respective shields should unite the highest possible degree of strength and capability of resistance with the smallest possible weight.

As it would certainly be of great advantage, and would tend to save many lives, if the above-suggested idea was brought to perfection by numerous experiments being tried, I transmit it to you, Mr. Editor, knowing that you would certainly not refuse a space in your *Mechanics' Magazine* to anything that is likely to prove useful to the country.

For the information of all who should feel so much interested in the subject as to be induced to try experiments, I add the following hints:—A mixture of wool and horsehair, made into a sort of *felt* by being impregnated with resin or cobblers'-wax, &c., would be stronger (for the same weight) than wool alone. Two or more layers of *cane* (Malacca or other), each layer consisting of a number of long pieces of cane being glued or otherwise fixed quite close to one another, and the layers being placed upon one another in such a manner that the length of the canes in the one layer comes to lie crosswise upon the length of the canes in the other layer, would be stronger than a wooden board of even somewhat greater thickness and weight. Gutta percha is preferable to leather. A peculiar application of *iron wire*, in the shape of what I might call "iron-wire sheeting"—that is, a sheeting composed of a number of iron wires, which are closely pressed and fixed (soldered) to one another (on a similar principle as the *canes* mentioned above), and all of which have an undulating shape, would be preferable to sheet iron.

I have devised a kind of shield in which part of the soft substances is formed by a large sheet of tent-cloth, folded up, which, when the shield is unbuckled, may be unfolded, and thus there may be constructed, with the addition of one or two more shields, a *spacious tent.*

This latter kind of shield is to be buckled into a kind of frame, that consists either of wood or thin sheet iron, or thick leather, and the outer edge (on the front and sides) of which frame is protected by being covered with a thick roll of wool or other soft substance, and the inside of which frame is of such a shape that the shield fits into it in precisely a similar manner as a picture fits into a picture-frame, or a door into a door-frame; the shield to be fastened to the frame by means of straps and buckles.

The size of the shield depends upon the purpose for which it is intended, being of larger size for artillery than for infantry.

I am, Sir, yours, &c.,

G. J. G.

IS AERIAL NAVIGATION PRACTICABLE?

To the Editor of the Mechanics' Magazine.

Sir,—After ten years of thinking, writing, and talking about a navigable balloon, I feel anxious to "proceed to business." I want some decisive test applied to the project which I have propounded. I have experimentalised in a small way, and have satisfied myself of the following facts:

1st. That the Archimedean screw will regulate the position (in a horizontal plane) of an elongated balloon.

2nd. That there is no mechanical difficulty in constructing and working my aerial paddle-wheels.

The foregoing two facts apply to the all-important matters of propelling and steering. The following facts I have reason to rely upon, though I cannot say I have tested them by any special apparatus:

1st. A balloon may be propelled by a motive power in the car.

2nd. The "indicator" which I have invented will provide effectually against the risks of travelling in the dock.

The following principles I am prepared to demonstrate:

1st. If a balloon be propelled through the air, the velocity of the balloon will reach its maximum when the atmospheric resistance is equal to the propelling power.

2nd. The intrinsic velocity and direction of the propelled balloon is not affected by the force or direction of the wind.

3rd. The geographical velocity and direction of a propelled balloon is determined by the intrinsic velocity and direction of the balloon, compounded with the velocity and direction of the wind.

Sundry portions of my motive engine have been tested, including the actual motive power. The testing process includes the apparatus by which the engine would "feed" itself, so that it might be left untended for a much longer time than the steam engine.

The working of the Archimedean Balloon might be tested on a comparatively small scale, by using condensed air as the motive power. A balloon of a cylindrical form, say 30 feet in length, might be constructed with paddles and screw complete, its engines to be worked by condensed air. Such an apparatus would be exceedingly useful for experimental purposes. With suitable precautions it might be launched in the open country, and the machinery being properly "set" at starting, the balloon might be left to the control of its engines, and, after a time, it would sink to the earth from the exhaustion of the condensed air in connection with the machinery. This would peril nobody's neck, and would cause little peril to anybody's purse. If tolerably successful (and we could hardly expect more from such a contrivance) the mere exhibition of the machine might be made remunerative and useful, while the experiment was being prepared on a larger and more practical scale.

In the next place I would suggest that an ordinary steam engine might be employed, in connection with paddle-wheels of a practical size, in order to discover what amount of propelling power could be obtained from so much horse-power in the engine. This could be settled without any attempt at "flying." This being done, it would be ascertained whether the steam engine would answer for aerial purposes.

If it were found too heavy, then the steam engine should be laid aside, and experiments could be tried with my new motive engine. When the engine question was settled, then the construction of the hull might be proceeded with; and when that stage was accomplished, the power of the machine might be tested by means of a railway and a species of turn-table, the former in reference to the paddles, and the latter in reference to the steering apparatus. After this, the required magnitude of the balloon could be estimated, with the construction of which the entire machine would be completed. It would not be needful at once to start off into the air; but flights at an elevation of a few yards only might be conducted. When the operation of the whole affair had been properly tested, then a bold flight might be attempted, to demonstrate "the practicability of aerial navigation."

In this way, I conceive, we might gradually put theory to the test of practice, and limit the risks of money and life to a narrow circle. The entire process would be a series of tests, until the whole was proved to be correct.

I might enlarge still further. I might enumerate other facts, and other principles, and I might make further suggestions. I should be glad to hear from any person upon the subject, and I should be most happy to meet any one for the same purpose.

Thanking you sincerely for the opportunity of thus addressing the scientific public,

I am, Sir, yours, &c.,

JOSEPH PITTER.

254, High-street, Borough,
London, S. E.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BUCHANAN, J. *Improvements in propelling vessels.* Dated Sept. 13, 1856. (No. 2151.)

In this invention, according to one modification, the vessel has a curved channel in the centre of the bottom. This channel only extends a portion of the ship's length, gradually rising from the longitudinal bottom line of the vessel, reaching its greatest height at the centre of the vessel, whence it gradually re-descends to the bottom line. In the channel is placed the propeller, which may be of any suitable kind.

KNOWELDEN, J. *Improvements in the arrangement of valves and apparatus for preventing steam boiler explosions.* Dated Sept. 13, 1856. (No. 2153.)

The improved valves, &c., cannot be described without engravings.

LASSIE, J. B. J. *A new system of aërial navigation.* Dated Sept. 15, 1856. (No. 2154.)

This consists in an aërial ship or carriage, having an outer and inner cylinder on an axis, so that the crew or passengers, by walking inside the inner cylinder (which is supported by gas) cause it to rotate, and with it the outer cylinder furnished with a screw, and thus propel the vessel in the air.

CLEMENTS, C. F. *An improvement in separating copper and other metals from ores containing them.* Dated Sept. 15, 1856. (No. 2155.)

This consists in applying muriatic acid vapours to act on ores containing copper and other metals. The ores are to be oxides, and the acid vapours from furnaces used in the manufacture of sulphate of soda are, together with water or steam, to act on the ores. The liquids thus obtained are to be treated by well known means for separating the metals therefrom.

KLINE, C. *The improvement of mariners' and other compasses, by which the effect of local attraction is cut off or neutralized, and the compass is made to traverse more perfectly.* Dated Sept. 15, 1856. (No. 2156.)

The compass needle is surrounded with an insulated shield of iron or steel, left to traverse freely by the natural magnetism of the earth.

CRANSTOUN, G. C. T., G. YOUNG, and J. LOVELL. *Improvements in the application of steam for producing a boiling action in bleaching and other manufacturing processes.* Dated Sept. 15, 1856. (No. 2157.)

This is particularly applicable where a number of boiling kiers are used, and in carrying it out such kiers or boiling vessels are so connected by pipes or passages, that what would ordinarily be the waste steam from one kier is made to produce the boiling action in a second kier. The steam rising from the second kier is conveyed to a third kier, and so on. From the last kier the steam is made to pass into the water from which the kiers are supplied.

ROWAND, A. *Improvements in cases or vessels for holding gunpowder.* Dated Sept. 15, 1856. (No. 2158.)

Glass flasks or bottles are to be used. The general shape preferred is that of a comparatively long bottle, presenting a flat ellipse in transverse section.

CHODZKO, S. *Improvements in the manufacture of manure and the apparatus employed therein.* Dated Sept. 15, 1856. (No. 2159.)

This consists in the following methods of, and apparatus for, manufacturing manure from urine, fecal matters, street sweepings, rubbish, and animal and vegetable refuse. The invention includes — 1. Apparatus which the patentee terms "*bâtiments de graduations.*" 2. Similar apparatus which he terms "*ponts de graduations.*" 3. The utilisation of the encrusting property of urine. 4. Exposure of the matters to atmospheric air. 5. The employment of sulphurous acid gas. 6. The employment of hydrochloric acid gas. 7. The use of salt (of salt water or salt marshes). 8. Intercepting media or temporary supports for the matters.

GARROOD, R. E. *Improvements in stop-cocks and valves for the drawing off and passage of air, gas, steam, water, and other fluids, or for any other purpose for which the same may be applicable.* Dated Sept. 16, 1856. (No. 2160.)

These improvements consist chiefly in the adoption of the principle of the telescope slide in constructing cocks and valves.

NEWTON, A. V. *An improved preparation of phosphoric acid.* (A communication.) Dated Sept. 16, 1856. (No. 2161.)

Carefully washed and burned bones, finely ground, are sifted with continual stirring into freshly diluted oil of vitriol. The mass is stirred from time to time for three days, when there will have resulted phosphoric acid, superphosphate, and sulphate of lime, with a small proportion of salts of magnesia and soda. The pasty mass may be mixed with flour or starch, or any farinaceous substance, while moist, and permitted slowly to dry, or it may be mixed with freshly burnt gypsum and then dried, or with stearine or other fatty bodies and dried, &c.

NEWTON, A. V. *Improved apparatus for raising water by atmospheric pressure.* (A communication.) Dated Sept. 16, 1856. (No. 2162.)

When applying the invention to the pumping out of water from mines, a series of exhaust vessels or air-tight tanks is provided, and set one above the other. These tanks are connected by pipes, so as to form a water channel from the bottom of the mine to where the water is to be discharged. Connected to each of these tanks, by branch pipes, is an exhaust pipe which leads to and connects with an exhaust pump actuated by the motive power engine at the top of the main shaft.

WALKER, R. *Improvements in ascertaining the draught of water and trim of ships or vessels.* Dated Sept. 16, 1856. (No. 2163.)

A vacuum gauge is used, communicating with the exterior water by a pipe passing through the vessel, so that the instrument will indicate, on a suitable scale, the draught of the vessel. It is preferred that this in-

strument should communicate with the water at some parts near the middle of the ship, so that it may always show the average draught; and there are indicators in connection with it acted on by hanging weights so as to show if the vessel is on an even keel, or the amount of deviation therefrom; also the amount of list the vessel may have on either side.

BOUSFIELD, G. T. *Improvements in power looms for weaving wire cloth.* (A communication.) Dated Sept. 16, 1856. (No. 2165.)

These improvements are especially applicable to the weaving of coarse wire fabrics, in which the filling wire is too inflexible to be inserted by a shuttle and bobbin, and relate to apparatus for preparing and inserting the filling wire, by means of which the filling wire, instead of being introduced into the shed of the warp wire by a shuttle, is either pushed in by the action of rollers, or drawn by nippers. Another improvement relates to delivering out the wire warps, and consists, in part, in giving to each warp wire a separate tension on a separate spool or beam, and delivering the whole during the weaving by rollers. Also, in combining with a power loom for weaving wire cloth a railway delivery motion.

BROOMAN, R. A. *Improvements in water closets and night stools.* (A communication.) Dated Sept. 16, 1856. (No. 2166.)

Water closets and night stools are so constructed that the weight of a person, applied to the seat thereof, shall act upon an arrangement of parts which transmit the soil to the common drain or soil channel (in water closets) or the removeable receptacle (in night stools), cleanse the pan, and prevent the escape of noxious gases, both when the closet or stool is in and when it is out of use.

MUSHET, R. *Improvements in the manufacture of iron.* Dated Sept. 16, 1856. (No. 2168.)

This consists in the admixture of a compound of carbonaceous matter and manganese with iron purified or decarbonised by air being caused to pass through it whilst it is in a heated and fluid state, at the commencement of, or during, or at the end of such decarbonising or purifying process.

MUSHET, R. *Improvements in the manufacture of iron.* Dated Sept. 16, 1856. (No. 2170.)

This consists in the use of combustible carbonaceous matters together with air or blast in the decarbonising or purifying of molten cast-iron, by introducing such matters into the furnace or vessel containing such molten cast-iron during the process of decarbonising or purifying it.

MARTIEN, J. G. *Improvements in the manufacture of iron.* Dated Sept. 16, 1856 (No. 2171.)

This consists in applying to, and disseminating amongst fluid metal possessing the characteristics of iron, as it flows from, or whilst in a transition state from a melting or remelting furnace or cupola, air, oxygen, chlorine, hydrogen, carburetted hydrogen, or any desirable vapour, or gas, for the purpose of heating, oxidising, deoxidising, carbonising, decarbonising, purifying, &c., the metal. It also consists in applying to and disseminating amongst fluid iron, nickel, or matter containing nickel, zinc, manganese, carbonating matter of any kind, kaolin or matter containing kaolin, chloride of sodium, chlorates, carbonates, nitrates, or any saline, alkaline, vegetable, earthy, mineral or metallic matter, for the purpose aforesaid.

BURNS, R. *Improvements in bone mills.* Dated Sept. 17, 1856. (No. 2172.)

These consist in a mode of arranging and fixing the cutters on the cutting cylinder of bone and other like mills, such cutters being curved. They require engravings to illustrate them.

CRICHTON, D., and J. CATHCART. *Improvements in looms for weaving.* Dated Sept. 17, 1856. (No. 2174.)

This consists of apparatus to produce intermittent rotary motions of different velocities, "from a series of advancing and a series of receding intermittent motions, working alternate motions (backwards and forwards) intermittingly."

BARBER, J. *Improvements in machinery or apparatus for mill and other engraving, punching, dividing, and ruling rollers, either for hand or machine engraving, and an improved mandril used in mill, eccentric, and other machinery employed in engraving rollers for printing and embossing calicoes and other fabrics.* Dated Sept. 17, 1856. (No. 2175.)

The patentee obtains increased facility in dividing and punching the pitch pins on the rollers for engraving by mill and other machines, and in the setting out for hand and other engraving by an improved method of securing the roller to the mandril. Several other modifications, which cannot be intelligibly described without engravings, are also included.

ANDRAUD, A. *Certain improvements in wheelbarrows.* Dated Sept. 17, 1856. (No. 2176.)

The patentee employs two wheels, and forms the nave or boss in two parts divided transversely; each part has a wheel, placed near its end. He forms the body partly over the wheels, and that it may be readily upset, makes the back board large and of a somewhat oval or circular form, on which it may be rolled over in upsetting and being righted. He further provides a moveable

way for the barrows in case of excavating, by which the transport is facilitated.

SPITTLE, W. F. *A new or improved spindle for braiding or plaiting machines.* Dated Sept. 17, 1856. (No. 2177.)

This consists of a spindle in which the reel carrying the thread is situated parallel to, but not upon the central shaft or axis of the spindle. 2. In making the weights of spindles for braiding and plaiting machines hollow, and adjusting the same by means of shot or other small weights. 3. In making the top of such spindles of a separate piece of hardened steel.

NEWMAN, A. L. *Improvements in processes for separating animal from vegetable fibre, and for adapting the products to manufacturing purposes, and in the machinery employed therein.* Dated Sept. 17, 1856. (No. 2178.)

The inventor first protects the animal fibre from the action of the acids (or other agents) used for dissolving the vegetable matter by taking the mixed material and saturating it in two solutions, one made of alum, sulphate of alumina, sulphate of zinc, chloride of tin, acetate of lead, or acetate of alumina, the other of oleaic, stearic, or margaric acids, or of soap dissolved in water (or in alcohol, and then added to the water). After having thus protected the animal fibre, he destroys the vegetable by the use of any of the well-known chemical agents usually applied for this purpose.

SCHRÖDER, C. H. *An improved rotatory engine, to be worked by steam or other elastic fluid, which invention is also applicable as a rotatory pump for raising and forcing liquids.* Dated Sept. 17, 1856. (No. 2179.)

This consists in placing the working cylinder or steam space (in which the piston and shaft revolve) with its axis at an angle to the axis of the engine shaft, the said steam space being divided into two equal parts in a diagonal direction, by a circular division plate at right angles to the axis of the shaft, and provided with an opening through which a solid piston works.

DAVIES, G. *Improvements in apparatus for actuating railway breaks.* (A communication.) Dated Sept. 17, 1856. (No. 2180.)

The principal feature here consists in employing one of the running wheels of the engine or tender or of a carriage for applying the breaks to the wheels of a train, by means of a cord or belt, &c.

HETHERINGTON, J. M., and J. GEE. *Improvements in flyers for preparing cotton and other fibrous substances for spinning.* Dated Sept. 17, 1856. (No. 2182.)

This relates to flyers constructed with single or double pressers, and consists in gaining the required pressure by means of an inclined plane or planes, resisted by a weight, or by elastic force, which improvement is also combined with flyers upon the centrifugal principle.

HINDE, T. C. *An improvement or improvements in the manufacture of iron.* Dated Sept. 18, 1856. (No. 2184.)

The patentee takes the red oxides of iron or the hæmatites in the raw state, but when he employs ores which may contain sulphur, phosphorus, &c., that can be volatilised, he prefers to calcine the ore. He then places the ore in a furnace, in alternate layers with charcoal, coke, or other carbonaceous matter. A covering of some incombustible material (as fine tiles or sand) is laid over the top, and he then applies fire externally, gradually getting the furnace up to as high a heat as can be applied without melting the materials. As the affinity of the carbon for the oxygen of the ore is developed by the temperature of the furnace during the descent of the ore, the reduction of the ore takes place, and the last portion of oxygen being finally withdrawn, metallic iron remains in a spongy mass, containing the earthy portions of the original ores mechanically mixed with it. In this state the iron is malleable; if broken up, much of the earthy matter will fall out from its pores, and it may even be welded. It is, however, advisable to carry on the carbonisation in the furnace till it becomes either of a strong steely nature, or with more carbon assumes the character of grey forge pig iron, and finally, by a still more prolonged cementation with the carbon, it imbibes so much as to be a perfectly grey foundry iron. It is next taken to the blast furnace, but there remains nothing more to do than to melt the converted ore with limestone or other flux. The metallic iron contained in the converted ore trickles down to the hearth, while the limestone, seizing the earthy residuum, fluxes with it, and forms the cinder which is allowed to run off in the usual manner; the iron also is tapped out at the bottom, and runs into the moulds provided for it as in the ordinary way of working.

JACQUEMIER, L. *An improved method of hardening and colouring alabaster and other gypsums and calcareous stones and earths.* (A communication.) Dated Sept. 18, 1856. (No. 2186.)

This consists in exposing alabaster and other kind of gypsum and calcareous stones and earths to a heat of about 212° Fahr., in order to expel and drive off therefrom the watery particles contained in it. When sufficiently dried, the gypsum is plunged several times in clear water, and is then exposed to the atmosphere to complete the hardening process.

PLUMMER, W. F. *An improved mode of preparing hard wheat and other hard grain for grinding.* Dated Sept. 18, 1856. (No. 2190.)

The grain is run through a damping machine formed of rollers covered with flannel, whereby moisture for softening the outer coating (and thus permitting of the easy removal of the bran) is imparted to the individual seed.

GREENWOOD, T. *Improved machinery for trimming the teeth of wheels.* Dated Sept. 18. 1856. (No. 2191.)

To trim, for example, a bevelled wheel, the patentee provides a bed-plate or frame to receive four sliding beds or frames arranged at right angles to each other, and capable of adjustment to suit various sizes of work. Upon a shaft on one of these sliding beds, and capable of receiving a slow axial motion, he keys the cast wheel which is to be trimmed. In a line with the shaft that carries the wheel is a sliding bed, to which two adjustable slide frames are connected. On these slide frames work the slides which carry the cutting tools. They are so connected to a common centre that (besides the primary adjustment) they are capable of receiving both a lateral and a vertical movement, the first for constantly varying the angle of traverse of the cutters to suit the work in hand, and the other to enable the tools to give the curved figure to the sides of the teeth. The cutters act alternately, and at opposite sides of the wheel and of the teeth, a reciprocating motion being given to them through crank rods by a central crank.

GOODYEAR, C., jun. *Improvements in the manufacture of pen-holders and handles for pen-holders.* Dated Sept. 18, 1856. (No. 2193.)

This consists in the application of India-rubber hard compound in the manufacture of pen-holders.

ROUSSEN, J. B. H., DE. *Certain improved appliances for washing and cleansing ores.* Dated Sept. 19, 1856. (No. 2194.)

This consists of an improved sieve and brush for washing and purifying metallic ores.

VASSEROT, C. F. *Improvements in filtering on a large scale.* (A communication.) Dated Sept. 19, 1856. (No. 2196.)

The inventor proposes to augment the head of water upon the filter, or diminish the pressure under the filter, for the purpose of increasing the quantity of water which the filter is capable of treating in a given time.

LAFFITTE, P. *An improved engine with rotary piston, applicable to various purposes.* Dated Sept. 19, 1856. (No. 2198.)

This engine consists of a cylinder having closed ends, in which a rotating piston is fitted. The piston forms an eccentric on a shaft, which is concentric with the cylinder. Between the induction and the eduction ports a sliding diaphragm is situated. This forms an abutment for the steam.

HUSTLER, A. *Improvements in looms for weaving.* Dated Sept. 19, 1856. (No. 2199.)

This relates to looms wherein two or more shifting or changing shuttle boxes are employed in each loom, for varying the weft. One part of it consists in so arranging and working such looms, that the shuttle boxes shall be brought into and out of positions for operating, in different directions; that is one or more in a vertical, and others in a horizontal direction. Another part consists in mechanism in connection with the shifting or changing shuttle boxes of such looms.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

MOREAU, F. *Improvements applicable to the tops of omnibuses and other carriages.* Dated Sept. 15, 1856. (No. 2152.)

This consists in protecting passengers on the top of omnibuses from rain, &c., by a covering in the form of a marquise tent, or of a roofing of any description, partly fixed and partly moveable; or a simple tent covering only.

LAVENDER, R., and E. *Improvements in raising water and other fluids, and in obtaining power thereby.* Dated Sept. 16, 1856. (No. 2164.)

This consists in raising fluids by an apparatus, which consists of two upright cylinders between and over which a pulley is mounted, and over this pulley an articulated piston is hung, its ends passing into the two cylinders. When the pulley is in motion, the balance of the piston is disturbed, and one of its ends descends into one of the cylinders, displacing the fluid which flows up around the piston and over the top of the cylinder, where it is received by channels; then, by giving motion to the pulley in the opposite direction, the other end of the piston descends into the other cylinder, and so on.

ELLIOTT, J. *An improvement in taps and cocks.* Dated Sept. 16, 1856. (No. 2167.)

This consists in fitting in the fluid way an India-rubber case or pouch, having a flexible rim at top resting on the outer surface of the tap, and having on it a bridge which supports and forms the axis for a lever or handle, carrying a leaf or stiffening piece, which enters into and fills the pouch or case. When the pouch is in place, it entirely closes the fluid way. To open the

tap the handle is moved so as to bring the case up against the top or side of the tap, and so leave a clear passage for the fluid.

MUSHET, R. *Improvements in the smelting of iron ores.* Dated Sept. 16, 1856. (No. 2169.)

This consists in the use of combustible carbonaceous matters together with air or blast in the smelting of iron ores. The inventor blows into a furnace used in the smelting of iron ores powdered coal, coke, charcoal or peat, so as to produce in the lower parts of the furnace gases of a nature which are calculated by their combustion to raise the temperature of those parts of the furnace or its contents, and which also have a tendency to deoxydise the ores or metal, and to improve the quality and increase the quantity of iron obtained from the ores.

MARSDEN, C. *Improvements in fastenings for shirts and other garments, together with an improved tag.* Dated Sept. 17, 1859. (No. 2173.)

In his fastening the inventor dispenses with studs, buttons, or pins, and forms it of linen and cord, so that the whole fastening may be washed with the garment.

SCHELLER, F. H. R. *An improvement in the manufacture of illuminating gas.* Dated Sept. 17, 1856. (No. 2181.)

The inventor carries on the distilling process as heretofore, and when the gas given off begins to fail in its illuminating power, he conducts into the retorts a suitable quantity of the tar which was given off at the earlier part of the process. Or he collects the tar into a boiler or still, and subjects it to heat, vapourising the volatile parts, and these he then conducts to the retorts. By this means the poor gas will be enriched.

BAGGS, I. *Improvements in melting or reducing copper and other metals from their ores, and in the manufacture of sulphuric acid in or by such processes.* Dated Sept. 18, 1856. (No. 2183.)

The ore (supposing it copper), having been calcined or not, is placed in a reverberatory furnace, and submitted to heat until fused or melted. The result is the silex or other flux (which is put in with them when the latter is uncalcined) combines with the oxide of iron, if any, forming silicate or slag, which is skimmed off. The application of heat being continued, the inventor then passes into the mass jets of air, or oxygen, or other gas through tuyères. By this process the arsenic is volatilised in the form of arsenious acid, and then condensed in the ordinary way, while the other impurities are got rid of by oxidation.

HORREX, T. *Improvements in means or apparatus to facilitate the delivery of coals to cellars and other such places.* Dated Sept. 18, 1856. (No. 2185.)

An inclined trough is used as a shoot, in combination with a hopper placed over the opening to the cellar, as a means of conducting the coals at once from the waggon, when that is practicable, or otherwise direct from the mouth of the sacks.

HILL, G. *Improvements in feeding steam boilers.* Dated Sept. 18, 1856. (No. 2187.)

This consists in the construction of a self-acting apparatus as a substitute for a force-pump for maintaining the water in steam boilers at the required level under any degree of steam pressure.

GUILLAUMIN, A. G. *An improved ramrod.* Dated Sept. 18, 1856. (No. 2188.)

This consists in the use of ratans and malacca and other canes, in the manufacture of ramrods for fire-arms.

WILSON, R. *Improvements in the construction of fireproof floors and ceilings, applicable in part to the construction of bridges and other structures.* Dated Sept. 18, 1856. (No. 2189.)

This relates chiefly to a metal beam and girder composed of two lengths of sheet or plate iron, put together so as to form a hollow girder, triangular in section.

COOPER, W. H. *An improvement in the manufacture of fretwork for ornamental windows or lights, applicable also to the cutting of irregular figures in glass generally.* Dated Sept. 18, 1856. (No. 2192.)

The chief object here is to produce geometrical and other patterns in glass without the use of lead, except at the edges of the various parts of the pattern. The inventor proposes in the manufacture of fretwork to cut out the different colours to the form of the corresponding colours in the design, and then to fit them together by lead, as heretofore.

BISSEKER, W. J. *Improvements in strings or wires used in or on musical instruments.* Dated Sept. 19, 1856. (No. 2195.)

The inventor deposits, by chemical or other means, a coating of gold, or gold and its alloys, upon strings or wires used in musical instruments.

SMALE, J. *Improvements in the mode, means, or apparatus for printing or transferring designs or letters on to glass.* Dated Sept. 19, 1856. (No. 2197.)

The inventor proposes, after setting up the type (in transferring letters), to print off on to a glazed or oiled paper; this, on withdrawal from the press, he reverses and places upon the glass, pressing or rolling the same until the colours are transferred. When this is complete, he proposes to add powder to give the letters the appearance of body. He proposes to fill up the blanks (when desirable) with any appropriate material. A coat of varnish may then be given to the whole back.

PROVISIONAL PROTECTIONS.

Dated April 2, 1857.

912. François Auguste Laurecisque, of Paris, gentleman. An improved system of constructing dissected maps or charts.

914. Richard Husband, of Manchester, hat-manufacturer. Certain improvements in the manufacture of hats and other coverings for the head, and in the instruments employed in the said manufacture.

916. Duncan Morrison, of Bordesley Works, Birmingham, and Samuel Lilley, of Birmingham, engineer and machinist. An improvement or improvements in locks.

918. Robert Otway, of Lambeth, engineer. An improvement in scythes.

920. Richard Archibald Brooman, of 166, Fleet-street, London, E.C., patent-agent. A steam windlass and boiler for the same, together with certain modifications to enable the windlass to be worked by hand. A communication.

Dated April 3, 1857.

922. William Hardman and James Dugdale, of Farnworth, near Manchester, spindle and flyer manufacturers. Improvements in machinery for preparing cotton, flax, wool, or other fibrous materials.

924. William Holland, of Birmingham, tool-maker. A new or improved manufacture of runner notches and top notches for umbrellas and parasols.

926. William Henry Taplin, of London. Improvements in the construction of fire-places and stoves.

928. John Smith, of Bradford, York, machine-maker. Improvements in machinery or apparatus used in the manufacture of brushes for flour-dressing machines.

930. Arthur Paget, of Loughborough, Leicester, manufacturer. Improvements in machinery or apparatus for the manufacture of looped fabrics, and in the manner of constructing the same.

932. Thomas Whitehead, of Leeds, machine and tool-maker. Improvements in spinning flax, tow, and hemp.

934. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in the treatment of floss silk. A communication from E. Royer and F. Rouse, of Paris.

Dated April 4, 1857.

936. Joseph Ferdinand Toussaint, of Brussels, notary public. A method for facilitating the examination and discovery of fissures, flaws, or deteriorations in the inserted or hidden parts of axles or other like pieces of machinery subject to decay and rupture.

938. George Spencer, of Cannon-street West, London, civil engineer. Improvements in machines used for facilitating the discharge of coals, minerals, earths, and other similar materials, from wagons used on railways, tramways, and common roads.

940. Elkan Adler, of New York, and Robert Parker Abernethy, of Cincinnati, United States. Improvements in machines for cleaning knives and other similar articles.

942. Charles Renshaw, of Dukinfield, Chester, engineer and millwright. Improvements in self-acting differential valves.

944. James Milnes, of Bradford, York, engineer, and Frederick William Mowbray, also of Bradford, civil engineer. Improvements in lubricating the pistons and valves of steam engines.

946. Job Mead and George Mead, of Bethnal-green, iron-plate workers. Improvements in metallic and other packing-boxes or cases.

948. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in the manufacture of hard India-rubber. A communication from A. C. Morey, of Paris.

952. John Penford Harvey, of Spalding, Lincoln, miller. Improved machinery for crushing land or clods.

954. William Perks, jun., of Birmingham, manufacturer. A new or improved manufacture of crown and sheet glass.

956. John James Rippon, of Oakenshaw Print Works, near Accrington, Lancaster, manufacturer. An improvement or improvements in rollers or cylinders for printing fabrics.

Dated April 6, 1857.

960. Charles Burrell, of Thetford. Improvements in portable steam engines suitable for agricultural purposes.

968. Louis Jean Marie Siblet, of Paris. An improved pulp for the manufacture of paper.

Dated April 7, 1857.

970. Ebenezer Rogers, of Abercarn, Monmouth. Improved methods of applying fuel for heating purposes.

972. James George Hunt, of Cincinnati, United States. Improvements in fences and gates.

974. George Pearson, of Oldham, Lancaster, and Edward Jessop, of Manchester, machinist. Improvements in sewing-machines.

976. John Robinson, of Glossop, Derby, manager. An improved apparatus for driving or giving motion to power looms, which said improvement is also applicable to driving other machinery.

978. Charles Cochrane, of the Ormesby Iron Works, Middlebro'-on-Tees. An improvement in the heating of the blast for blast furnaces.

Dated April 8, 1857.

982. Barnabas Taylor, of Cranbrook, Kent. An improved arrangement of combined bed and utensil for the use of invalids.

984. Robert Kanzow Bowley, of Charing-cross, boot-maker. Certain improvements in boots and other similar coverings for the feet.

986. Martin Billing, of Birmingham, manufacturer. An improvement or improvements in the manufacture of metallic cornice ends.

988. Alfred Francis, of Encomb-terrace, Wandsworth-road, Surrey, gentleman. Improvements in fastening shutters and doors.

990. Charles Tilston Bright, of the Cedars, Harrow Weald, Middlesex, engineer. Improvements in laying down submarine telegraph cables, and in apparatuses to be employed therein.

992. Jasper Wheeler Rogers, of Roberts Town, Kildare, engineer. Improved means of, and apparatus for, collecting for use the excrement of towns and villages, and for facilitating the drainage of houses generally.

994. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improvements in hand bullet moulds. A communication.

Dated April 9, 1857.

996. Edgar Brooks, of Birmingham, manufacturer. Improvements in the manufacture of fire-arms.

998. William Oxley, of Manchester, engineer, and Hugh Strath, of the same place, foreman. Improvements in lubricators.

1000. Thomas Rolfe, of Regent-street, London, pianoforte-manufacturer. Improvements in pianofortes.

1002. Henry Thompson, of Great Harwood, Lancaster, warper, and Henry Walmsley, of the same place, book-keeper. Improvements in looms for weaving.

1004. Charles Frederick Bielefeld, of Wellington-street, Strand. Improvements in preparing the surfaces of slabs or sheets made of fibrous and cementing materials.

1006. George Edward Taylor, of Oatlands Mill, Leeds. An improvement in raising and shearing cloths.

1008. Robert Turnbull, of Harwich, Essex, foreman shipwright. Improvements in slips or ways for heaving up and moving ships, and in cradles for the same.

1010. John Leach, of Over Darwen, Lancaster, overlooker. Improvements in looms for weaving.

1012. John Coope Haddan, of Cannon-row, Westminster, civil engineer. Improvements in the manufacture of, and in the means of, and apparatus for, discharging projectiles.

Dated April 11, 1857.

1016. William Smith, of Salisbury-street, Adelphi, civil engineer. A universal Jacquard apparatus. A communication from C. Anciot, of Rouen.

1018. Charles Smith, of Holloway, Middlesex. An apparatus to be used in connection with certain domestic utensils.

1020. Henry Félix Courenq, merchant, of Toulouse, France. Improvements in machinery for ruling paper.

1024. Richard Archibald Brooman, of 166, Fleet-street, London, E.C., patent-agent. Improvements in the distillation and rectification of spirits, in apparatuses employed therein, and in the preparation of the substances to be distilled. A communication.

1026. William Gresham Wiles, of Lady's Well Brewery, Cork, brewer and manager. Improvements in brewing.

1028. Thomas Nathaniel Pengelly, of Gloucester-street, Commercial-road East, engineer, and George Porter, of Mary Ann-terrace, Abbey-street, Bethnal-green-road, bricklayer. Improvements in the application of steam to lifting or hoisting coals and other goods from ships' holds.

1030. Thomas Robert Winder, of Dover, engineer. An improved mode of constructing submarine works.

1032. Henry Adcock, of the City-road, civil engineer. Improvements in steam boilers.

Dated April 13, 1857.

1034. Thomas John Searle, of Wapping-wall, Shadwell, Middlesex. Improvements in fastenings for window-sashes.

1036. Thomas Richardson and Edmund John Jasper Browell, of Newcastle-on-Tyne. Improvements in treating old or waste railway wood, sleepers, and bearers, and in preparing or preserving wood for railway sleepers and bearers, and other works.

1038. Charles Goodyear, of Leicester-square, gentleman. Improvements in the manufacture of life-preserving apparel and other buoyant pliant articles.

1040. Augustus Edward Schmersahl, of Miles Platting, Lancaster, chemist. Improvements in treating bones for the purpose of obtaining gelatine, size, or glue, and in obtaining certain useful products from such treatment.

1042. Richard Archibald Brooman, of 166, Fleet-street, London, E.C., patent-agent. A method of, and apparatus for, disinfecting alcohol, or for separating essential oils therefrom. A communication from H. Breton.

1044. Thomas Greville Potter, of New Oxford-street, London. An apparatus for day and night advertising.

Dated April 14, 1857.

1048. Robert Hazard, engineer, of Thanet-place, Strand. An improved heat-extractor.

1050. Charles Jean Marie Lavigne, of Paris. Improvements in machines or apparatus for swinging, see-sawing, revolving, and for performing other exercises or amusements in the air.

1052. Thomas Harrison, of Nebthwait Mills, Lancaster, machinist. New or improved machinery for the manufacture of wooden pill-boxes, match-boxes, and other such like articles.

1054. Benjamin O'Neale Stratford, Earl of Aldborough, of Stratford-lodge, Wicklow, Ireland. Improvements in aërial navigation, and in the apparatus connected therewith, parts of which are applicable to locomotion generally.

1056. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in apparatus for generating and superheating steam. A communication from A. Prouvost, of Lille, France.

1058. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in fire-arms. A communication from F. Schepers, of Liège, Belgium.

1060. William Edward Newton, of Chancery-lane, civil engineer. Improved means of lighting gas for illuminating and other purposes. A communication.

Dated April 22, 1857.

1127. William Steel, of Glasgow, brewer. Improvements in discharging ashes from steam-boats.

1131. William Ogden and Henry Firth, both of Bacup, Lancaster, mechanics. Improvements in fans or blowing-apparatus.

1133. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in sewing-machines. A communication.

1135. Gerolamo Cavanna, of Genoa, Sardinia, mechanician. Improvements in obtaining motive power.

1137. Charles Etienne Osmont, of Paris. Improvements in penholders.

1139. William Rutt, of Sutton-place, Homerton, Middlesex. Improvements in microscopes.

Dated April 23, 1857.

1141. George Welch, of Birmingham, manufacturer. Improvements in metallic pens and penholders.

1143. Matthew Dunnett, of Glasgow, manufacturer. Improvements in embroidering or sewing, and in machinery or apparatus connected therewith.

1145. David Milnes, of Bradford, York, clerk. An improved manufacture of woven goods or fabrics.

1147. James Taylor, of Cullen, Banff, N.B. Improvements in apparatus for producing fire and light.

1149. Jacques Richard, near Melun, France, agriculturist. An improved agricultural machine for cleaning grain.

1151. George Wright, of Sheffield, stove-grate manufacturer. Improved apparatus for heating.

1153. William Colborne Cambridge, of Bristol, agricultural implement maker. Improvements in chain harrows.

1155. Andre Prosper Rochette, of Brighouse, York. An improvement in currying leather.

1157. Andre Prosper Rochette, of Brighouse, York. Improvements in currying leather.

Dated April 24, 1857.

1159. Edward Manico, of Bucklersbury, London, lieutenant Royal Marines. Improvements in obtaining foundations for marine or other structures.

1161. Jean Baptiste Bellon, of Moorgate-street-chambers, London, practical chemist. Improvements in mordants for use in dyeing processes.

1163. James Caddick and Thomas Hemmings, of the Garndyn's Iron-works, and David Caddick, of the Ebbw Vale Iron-works, near Newport, Monmouth. Improvements in puddling and balling furnaces for heating and melting iron or steel.

Dated April 25, 1857.

1165. Samuel Walmsley, of Stockport, Chester, agent. Certain improvements in machinery for

preparing and spinning cotton and other fibrous materials.

1167. Samuel Sunderland and Richard Dean, of Burnley, Lancaster. Improvements in looms.

1169. William White, of South Shields, Durham, ironfounder. Improvements in making moulds or matrices employed in casting metals.

1171. James Simpson and Edward Rimmer, of Manchester, carvers and gilders. A certain improvement in Venetian blinds.

1175. Rev. James Burrow, of Ashford Parsonage, Bakewell. Improvements in coating wrought iron.

1177. Joseph Belshaw, of Nottingham. Improvements in manufacturing knit fabrics.

Dated April 27, 1857.

1179. Amable Victor Felix Larchier, gentleman, of Paris. Improvements in the manufacture of gas. A communication from E. Lavezzari.

1181. Polydore de Keyser, of Cannon-street West, London, gentleman. An apparatus for preventing horses slipping. A communication.

1183. Edmund F. Barnes, of New York, United States. Improvements in telegraphic instruments, and called an "embossing telegraph."

1185. John Macintosh, of Euston-place, Euston-square. An improvement in the manufacture of air-beds, cushions, and other like inflated and fluid-tight apparatus or bags.

1187. Thomas Dickason Rotch, of Surbiton, Surrey. Certain new and useful improvements in gas-generators. A communication from A. A. Hayes, of Massachusetts.

1189. Julien Billiard, of Red Lion-square, Middlesex, importer of foreign goods. Improvements in the arrangements and construction of furnaces and other fire-places. A communication.

Dated April 28, 1857.

1191. James Withnall, of Manchester, coppersmith. Certain improvements in the manufacture of rollers or cylinders to be employed for printing calico and other surfaces.

1193. James Barker, of Blackfriars-road, Surrey, smith. An improved propeller for ships and vessels.

1195. William Armand Gilbee, of South-street, Finsbury, London. An improved mode of reefing and reducing top-sails. A communication from Isaac Boss, of New York.

1197. Wright Jones, of Pendleton, Lancaster, and Thomas Edwards, of Eccles, said county, engineers. An improved lubricator.

1199. George Newton, of Upper Thames-street, London, carpenter and builder. Improvements in copying and other presses.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1224. George Tomlinson Bousfield, of Loughborough-road, Brixton, Surrey. Improvements in collapsible boats and pontoons. A communication from N. Thompson, of New York. Dated 30th April, 1857.

1266. Robert William Sievier, of Rue du Cerf, Brussels. An improvement in the mode of treating saccharine juices in the manufacture of sugar. Dated 5th May, 1857.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," May 12th, 1857.)

3079. J. Petrie and W. McNaught. Improvements in steam engines.

3085. J. Morel. Improvements in castors for fitting under the feet of tables, seats, and other similar pieces of household goods.

3088. J. H. G. Wells. Improvements in pumps and valves used therewith. A communication.

3094. R. A. Brooman. Improvements in the construction of portable houses and other buildings. A communication.

1. J. T. Pitman. A machine for making carpet lining and other similar articles. A communication.

8. F. Ayckbourn. Improvements in stockings for personal wear.

9. F. S. Stott. Improvements in slide valves applicable to steam and other motive power engines.

10. A. Lorimier. An improvement in preparing the surfaces of printers' inking rollers and other articles when vulcanized India rubber is used.

11. W. H. Phillips. Improvements in stereoscopes.

12. J. Fowler, jun. Improvements in giving motion to ploughs and other agricultural implements.

14. E. V. J. L. Gorges. Improvements in preserving animal substances for food.

37. A. Brundish. Improvements in mounting knobs and in constructing and mounting roses for locks, latches, and other such like fastenings.

44. F. F. Dumarchey, S. Levy, and J Mayer. Improvements in wheels and axles for common road carriages.

49. F. H. Maberly. Improvements in constructing receptacles for sewerage, for separating the fluid from the solid portion thereof, and for purifying, storing, and carrying away the same.

51. C. E. Wright. Improvements in preparing lubricating compounds.

54. M. Trattles. Improvements in tools for cutting cylindrical and conical forms.

61. W. Y. Smith. An improvement in sawing all kinds of wood.

89. J. Hodgson. An improvement in constructing wrought iron masts, yards, bowsprits, and other ships' spars.

91. C. R. Olliffe and J. A. Gollop. Improved apparatus for cleaning knives.

104. A. Bower. Improvements in, or applicable to, the keels of navigable vessels.

106. W. Thurtell, jun. Manufacturing cases of deposit for adhesive stamps, labels, or papers, so arranged that such adhesive papers are moistened and kept in a moistened state, distinct and separate.

117. W. E. Newton. An improved steam engine. A communication.

123. J. Higham. Improvements in valve musical instruments.

127. A. V. Newton. An improvement in steam engines. A communication.

136. G. S. Moore. An improvement in combining steam engines and boilers when used with screw or stern propellers of ships or vessels.

155. W. H. Mitchel. Improvements in means for distributing and composing types.

163. A. V. Newton. An improvement in the manufacture of hosiery. A communication.

191. E. Mauder and W. Morgan. Improvements in the manufacture of photographic, jewellers', and other cases having wood or papier mâché foundation, and where raised, regular, or irregular forms are required in such cases, and the machinery for carrying out such improvements, parts of which are applicable to other purposes where sawing or shaping is required.

216. J. Harris. An improved method of stopping or retarding railway carriages and trains, locomotive and stationary engines and machinery, together with certain apparatus which may be employed therein.

227. W. L. Tizard. Improvements in fermenting, cleansing, and attemperating apparatus to be employed in brewing.

253. J. L. Norton. Improvements in steeping or washing and rinsing machines.

255. J. L. Norton. Improvements in separating animal from vegetable fibres.

366. J. Murdoch. An improvement in the process of treating the threads of floss silk, which is also applicable to the threads of other fibrous materials. A communication.

379. J. Bernard. Improvements in the manufacture or production of boots and shoes, or coverings for the feet, and in the machinery or apparatus employed in such manufacture.

501. J. Glover and J. Bold, jun. Improvements consisting of extended uses of photography, as applied to dials, tablets, and pictures.

502. W. Zipser and J. P. Klein. Improved machinery or apparatus to be used in the manufacture of woollen cloth.

657. F. A. Calvert. Improvements in machinery for ginning cotton, and for cleaning and carding cotton and other fibrous materials.

691. A. Knox and T. Robson. An improved gas regulator.

715. G. Travis. Improvements in apparatus used in the manufacture of cheese.

757. J. Millar. Improvements in stoppers or closing apparatus for decanters, bottles, and other receptacles.

776. T. S. Adshead and A. Holden. Certain improvements in machinery for carding cotton and other fibrous materials.

800. M. A. Crooker. Improvements in paddle wheels.

826. C. F. L. Oudry. Improvements in the preservation of articles of cast, wrought, rolled, and forged iron, zinc, and other metals or alloys of metals, against oxidation from humidity and other destructive effects of air and water.

846. G. White. Improvements in glass furnaces. A communication.

858. E. A. Spurr. Improvements in fire-places, chimneys, and stove grates.

887. S. J. Goode. An improvement or improvements in depositing metallic alloys by electricity.

942. C. Renshaw. Improvements in self-acting differential valves.

970. E. Rogers. Improved methods of applying fuel for heating purposes.

1036. T. Richardson and E. J. J. Browell. Improvements in treating old or waste railway wood, sleepers, and bearers, and in preparing or preserving wood for railway sleepers and bearers, and other works.

1037. J. and E. Ratcliff. An improved mode or modes of adjusting chandeliers.

1042. R. A. Brooman. A method of, and apparatus for, disinfecting alcohol, or for separating essential oils therefrom. A communication.

1119. A. F. Sherman. Improvements in machinery for the manufacture of ropes, strands for ropes, and for other purposes.

1123. J. Chanter and D. Annan. Improvements in furnaces when moveable fire bars are used.

1143. M. Dunnett. Improvements in embroidering or sewing, and in machinery or apparatus connected therewith.

1224. G. T. Bousfield. Improvements in collapsible boats and pontoons. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1007. Adrien Georges Amant Martin and Casimir Lefol.
1014. Bernard Joachim La Mothe.
1015. Josiah George Jennings.
1016. Bernard Joachim La Mothe.
1019. Richard Waller.
1024. Julian Bernard.
1029. George Barry Goodman.
1031. Théodore Lemielle.
1043. William Williams.
1044. John Anthony and William Treeby Chafe.
1046. Joseph Shepherd.
1051. Warren De la Rue.
1052. Henry Doulton.
1055. John Platt.
1084. John Chedgey.
1088. George Edward Dering.
1135. Louis Sautter.
1140. Robert Oram and William Oram.

LIST OF SEALED PATENTS.

Sealed May 8, 1857.

2643. William Stones.
2648. William Smith.
2649. John Fell Jones.
2659. William Lukyn, sen.
2660. George Islington Bache.
2661. William Weild.
2675. Alexander Hutton.
2676. Thomas Stephen Holt, Edward Earnshaw, and James Barlow.
2698. James Greaves.
2713. Alexandre Marie Joseph Eeckman.
2719. John Wilson.
2752. Richard Eaton.
2779. William Edward Newton.
2792. Henry Bragg, jun.
2800. John Brown and John Adin.
2807. Asa Lees and David Schofield.
2816. Camille Auguste Tissot.
2842. George Julius Vertue.
2864. Frederick Albert Gatty.
3029. William Henry Stratton.
3086. William Renwick Bowditch.
186. Henry Medlock.
256. Arthur Clark.
290. Henry Whittles and Robert Schofield.
369. Charles Turner and Louis Watermann.
453. Alexander Parkes.
492. Peter Cato and Joseph Betteley.
630. Rudolph Bodmer.
640. William Frederick Taylor Bradshaw.
697. Johannes Neuenschwander.
719. Thomas Horne.
755. George Forsyth.
761. James Murdoch.

Sealed May 12, 1857.

2662. Joseph Eccles.
2695. Christopher Binks.
2732. John Lord.
2750. Robert Brock Benson.
2766. Charles Garton and James St. John Gage Parsons.
2806. Henry Eastman Palmer.
2826. William Johnson.
2968. George Littlewood.
118. William Edward Newton.
192. Carl Christian Engström.
314. George White.
478. John Moule.
654. George Tomlinson Bousfield.
735. William Pidding.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

W. Green.—It is not sufficient to "unhesitatingly assert" that Mr. Bessemer has effected *real* improvements in the manufacture of iron, and that "the time is not far distant when the most sanguine and brilliant prophecies respecting it will be more than verified." We desire to practise perfect fairness to Mr. Bessemer. No journal has dealt more faithfully than our own with the Bessemer question; and our caution must not be construed into opposition. We have no doubt that many editors now envy our position in respect to the late controversy. We should be among the first to support any inventor who establishes the *reality* of his improvements. Let Mr. Bessemer do this, and he will at once number us among his eulogists.

On the Conservation of Force, we have received many letters, but none which seem to us to possess any strong claim upon our space. Mr. Cheverton replied, some days since, to the criticisms of his former letter, which were published in our pages on the 2nd of May, but we really cannot afford the necessary space to his reply. We have come to this conclusion reluctantly; not because we have any doubt as to the inutility of inserting Mr. Cheverton's letter, but because we hesitate to deprive an old correspondent, who has written usefully and excellently to us on very many subjects, of any advantage which he may think necessary. But other considerations are paramount. "*Nemo*" and "*Onward*" have each sent a letter of some merit, but we do not think they throw much new light upon the Conservation of Force. It is worthy of remark, that not one of our many mathematical readers appears to have seen in Professor Faraday's lecture any cogent arguments against the received definitions. We can only repeat that a certain degree of sound knowledge of mathematical science is essential to the successful study of the subject discussed by Faraday.

The letters of Mr. Atherton and Mr. Armstrong will appear in our next.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1763.] SATURDAY, MAY 23, 1857. [PRICE 3D.

Edited by R. A. Brooman, 166, Fleet-street.

THE NEW THAMES GRAVING DOCKS.

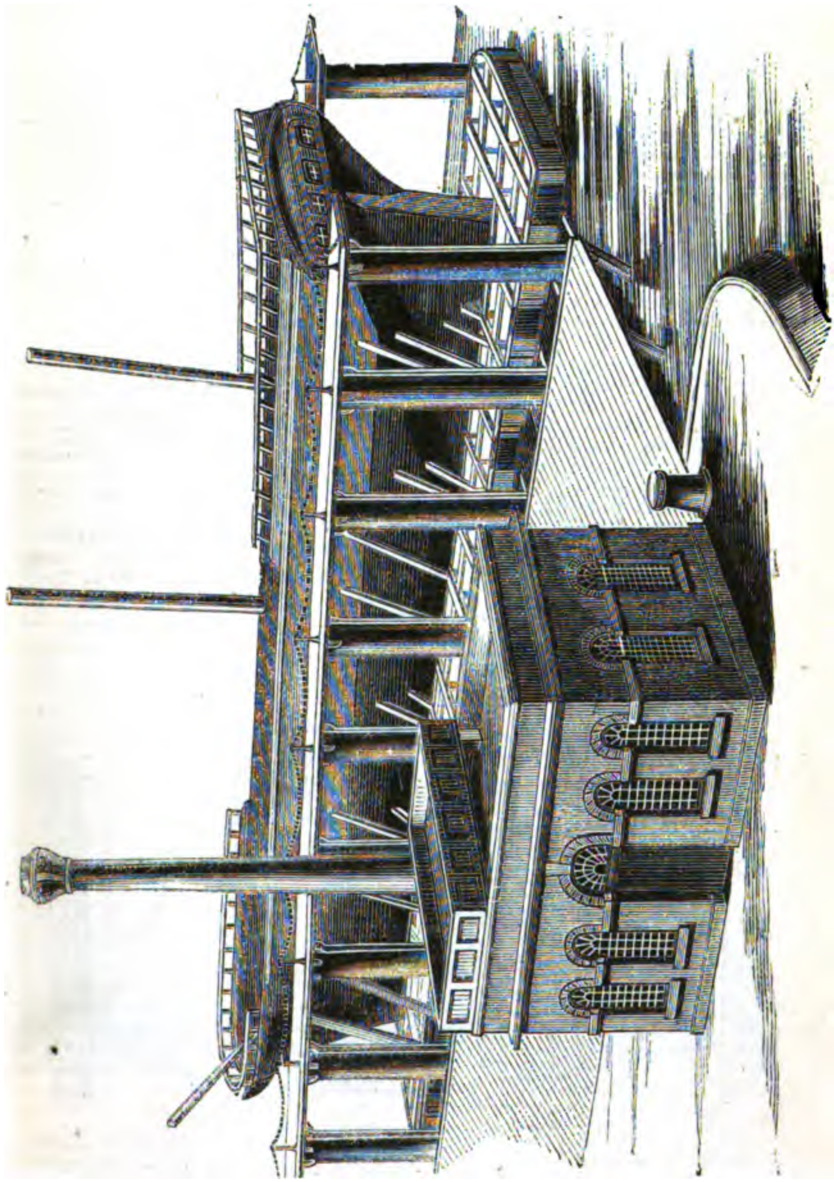


FIG. 1.—(View of the hydraulic lift, the saucer with a ship upon it, and the engine-house.)

THE NEW THAMES GRAVING DOCKS.

We propose, with reference to the works now in progress at the Victoria Docks on the Thames, near Blackwall, to say a few words on the several varieties of docks used for naval purposes.

Every one is familiar with those sheets of water called basins or wet docks, such as the East and West India, the London, Commercial, and Victoria Docks. These are simply artificial bays, surrounded by convenient wharves, in which bays there is no rise and fall of tide, and therefore little or no alteration in the relative heights of the wharf and the ship in the dock. To secure this important advantage, and at the same time to be able to dock and undock vessels at any time of the tide, it is necessary to close the entrance to the docks with two pairs of gates, the interval between which shall form a lock large enough to contain the ship to be docked. When a vessel is to be taken in at low water, the outer gate is opened, and the vessel drawn into the lock; the gate is then closed, and a communication is made between the lock and the inner basin by opening a sluice. The level of the water in the lock is thus raised to that of the water in the basin: the inner gate is then opened, and the vessel drawn in. In undocking, the operation is reversed. Both pairs of gates curve inwards, as it is not necessary to exclude the water outside when it rises above the level within. Wet docks or basins, in the Government yards, have only one pair of gates, or a caissoon, and therefore can only be opened at or near high water.

Dry docks are also small bays, framed with granite, or with wood, and having a solid and straight bottom on which the ship may be grounded, and firm sides to which it may be shored, as the water recedes. In most cases, the ship is shored gradually as the tide falls, the water passing out of the dock through an aperture in the gates, or the caissoon, which is closed as soon as the dock is emptied, but, in the Royal service, the dock is frequently pumped out by a steam engine. When a first-rate, fully equipped for sea, is laid in one of these docks, as is sometimes the case, there is a weight of about 7,000 tons on the bottom of the dock. The expense of making a foundation to receive this weight, by driving piles, laying concrete, &c., or by blasting out of the solid rock, as in the French dockyard, at Cherbourg and other places, is very great. For this and other reasons there have been invented various kinds of floating docks, which can be made to sink deep enough to receive the ship, and afterwards to rise with their burden until the vessel is raised above the surface, and is therefore dry.

Such is the floating dock recently patented by Mr. Edwin Clark, of Great George-

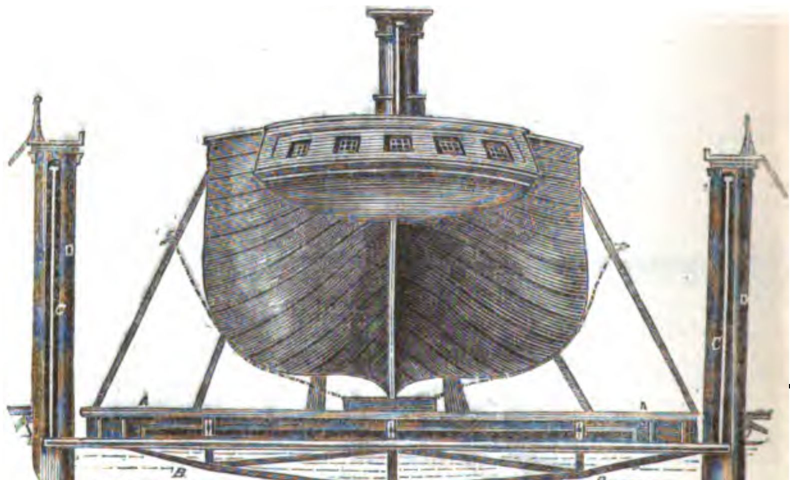


Fig. 2.

(Showing the vessel upon its saucer previous to floating it to shallow water. A is the saucer, or dock; B, the suspending girder; C C are the suspending rods, and D D, the hydraulic cylinders.)

street, Westminster, and now in the course of construction at the Victoria Docks, on the Thames. Each dock consists of a rectangular tank, or pontoon, of about 400 feet in length and 60 feet in breadth, or of such dimensions as, with an immersion of 4 or 5 feet, would sustain a large merchant ship. This tank is rather more than 5 feet deep, open at the top, and strengthened internally by a framing which supports the blocks on which the keel of the vessel is to rest, and which receives the heels of the shores. The peculiarity of Mr. Clark's invention consists mainly, however, in the means which he employs for lowering this tank steadily until the vessel can be drawn in upon it, and for raising it with its load to the surface again. It was by precisely similar machinery that the Britannia and Conway Tubular Bridges were floated and raised under his superintendence, and, considering the difficulties which had to be overcome in those cases, our confidence in the practicability of the proposed means hardly required to be strengthened by his assurance that they had been approved of by a great number of our most eminent engineers, including Messrs. Robert Stephenson and G. P. Bidder. The apparatus employed consists of two rows of cast iron columns, 5 feet in diameter, placed at intervals of 20 feet from centre to centre, with a space of 60 feet between the rows. They are sunk 12 feet into the bed of the wet dock, and extend about 25 feet above the water. Each column contains a small hydraulic press, 10 inches in diameter, with a 25 feet stroke. The ram of each press carries a small crosshead, from which are suspended, by means of suspending rods, two wrought-iron girders, 60 feet in length, which extend entirely across the dock, from column to column. Sixteen pairs of columns will, in this way, give a series of thirty-two suspended girders, capable of being raised or lowered by a fifty-horse engine, erected on shore, and communicating with the presses by means of pipes. The tank is floated in upon the gridiron,

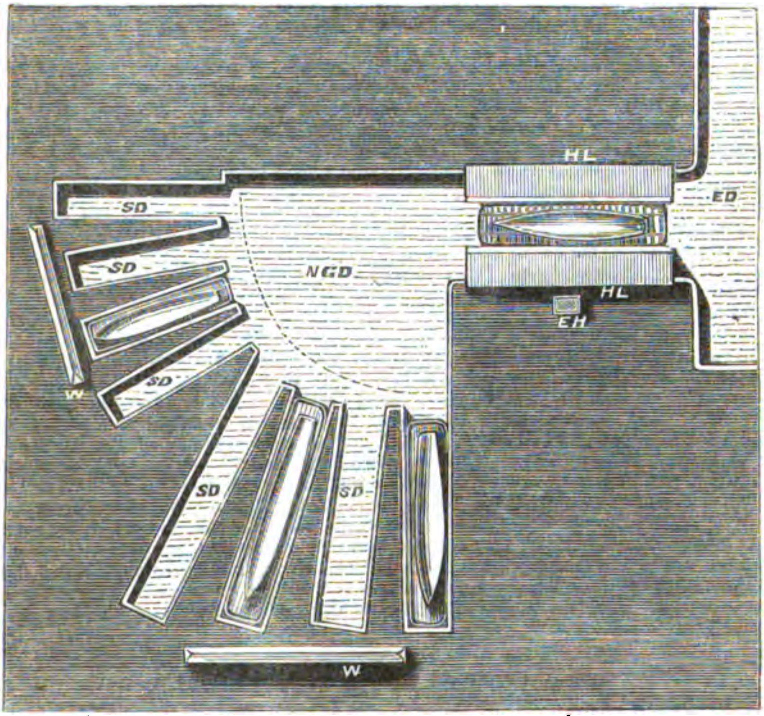


Fig. 3.

(A general plan, showing the arrangement of the hydraulic lift and shallow docks at the Victoria Docks. H L is the hydraulic lift; E D are the existing docks; N G D, the new graving docks; S D, S D, the shallow docks, in some of which ships are shown upon their saucers; W, the workshops, and E H the engine-house.)

formed by these girders, water is admitted within it by opening a sluice, and the gridiron is allowed to descend with the tank until there is sufficient depth of water over it to allow the vessel to be brought in between the columns. The float with the vessel upon it is then raised, the operation of shoring going on as it ascends, until the water in the tank is able to run off through the sluices. These are then closed, the gridiron is lowered, and in about forty minutes a vessel drawing 18 or 20 feet of water is left afloat on a shallow pontoon drawing only 4 or 5 feet. It may then be taken into one of a number of shallow docks, provided for the reception of the floats, in the vicinity of convenient workshops. It is expected that eight of these pontoons, with the lifting apparatus, will be complete, and in operation before the ensuing winter. It is stated that the contract price for the lift, with four pontoons, and eight shallow docks to receive the pontoons, is only £70,000.

There certainly, at first sight, appears to be a disadvantage in this arrangement, which would be avoided if the engine were employed, either to pump out the pontoons that they might be able to rise by their own buoyancy, or to pump the water from a reservoir, into which it might have been drawn from the pontoons by means of a siphon; as the loss of power involved in raising the pontoon and vessel 4 feet or 5 feet higher than the line of floatation would then have been avoided. But when it is remembered that in either of the cases suggested it would be necessary to make the pontoons some 25 feet deeper than his, in order that a portion of them might be above the water at all times to give them stability, it is impossible to deny that even with the drawback mentioned, his arrangement is a good one.

Wooden pontoons, having high cellular sides, pumped out by engines erected on them, have been in constant use for several years past in different parts of the United States, and the celebrated Russian Camel, made on a similar principle, is still older; but a great objection to their use is, that their enormous size makes them unmanageable, and most difficult of repair. One such dock would, moreover, cost considerably more than the contract price given above.

Like these, too, in construction, but different in principle, is the dock patented in 1852, by Mr. James Taylor, of Liverpool. The principle of his dock is—or rather should be, for he does not propose to adopt it fully—that no pumping should take place either during the docking or undocking of a vessel. It is of iron, cellular like the others, and fitted with gates or a caisson. When a vessel is to be docked, the gates are opened, and the vessel is drawn in upon the blocks; the gates are then closed, and sluices are opened to allow the water to run off from the cavity in which the ship is to the cellular compartments in the sides and bottom, which are large enough to contain the surplus water. The vessel can be shored immediately. While the ship is undergoing the necessary repair or examination, the water can be pumped from the cells into the sea. When she is to be undocked, a sluice may be opened to fill the internal space of the dock with water, which will sink it to its original level, and float the ship; the gates may then be opened and the vessel drawn out.

Although these docks are inferior in many respects to Mr. Clark's, every practical shipwright will see in them an important convenience which his does not possess. This is the means of shoring a large ship safely as the water falls. Mr. Clark says, "It is not necessary to describe in detail the method of shoring and staying the vessel upon the saucer, which is only a modification of existing practice, with this advantage, that after the vessel is lifted the additional shoring upon the saucer is completed in the open air." Whatever this supposed advantage may be, Mr. Clark may rest assured that the want of proper shoring accommodation is the weak point in his invention—a point, too, of so much importance that we feel convinced the company will ultimately have to resort to the old-fashioned plan of excavating docks. We do not doubt that *light* merchant ships of ordinary size may be shored in the way proposed; but we are quite sure that no large or heavy ship could ever be safely shored from the *flat* of a dock only. As a temporary means of securing the advantage of dry docks, without the great outlay required for excavation, we think the plan reasonable: but Mr. Clark must expect to fail if he attempts, as he proposes, to raise "by such a process a fleet of first-class ships of the line, with all their stores on board."

THE AMERICAN LAUNCHING FAILURE.

The Queen of the Pacific, noticed last week as stuck when partially in the water, was finally set afloat during the night of Saturday, the 11th ult., by jacking up the hull into a more inclined position, and reconstructing the ways. Thus repaired, she slid off on the final trial, without any assistance from tugs or derricks. The extra cost, in consequence of the mishap, is judged to have been about 4,000 dollars.—*Scientific American.*

AN IMPROVED HOMESTEAD AND DISTILLERY.

Everyone knows perfectly well that Mr. Dray, of Swan-lane, London-bridge, is one of the very first and most enterprising of our agricultural implement makers; but every-one is not aware that at Farningham, in Kent, that gentleman has erected and arranged a model homestead of a remarkably interesting character, and upon the same grounds has constructed a novel distillery, which has begun to attract much attention. This is, however, the case, and on the Wednesday of each week the learned in agriculture journey to Farningham to witness the improved farm buildings and distilling process.

The homestead is a building which we hope to see copied, in more or less detail, by all our agriculturists and cattle-feeders. It is a large rectangular structure, divided for about two-thirds of its length by partitions into three compartments, of which one is furnished with stalls for oxen, a second with stalls for horses, and the third with every kind of implement that can be desired for the preparation of the food of the cattle, such as corn-mills, bean-mills, root-slicers, chaff-cutters, &c., the whole of these being driven by a small steam engine. The remaining third of the length of the building is appropriated to the storing of fodder and grain, and the stowing of carts, field implements, &c., the granary being separated from the remaining portion by an additional floor and partitions. The building is covered by a light three-span roof, with iron framing, and amply glazed to supply light; and in the sides of longitudinal turrets rising from each span there are louvres which, with arrangements for admitting air below, ensure perfect ventilation. The cattle stalls in the two compartments are in each arranged on either side of a central passage leading from end to end, and each stall is fitted with an iron manger, a rack, and a water trough, to which water is constantly laid on from a reservoir, into which it is pumped by the steam engine. Harness rooms are arranged at each end of the compartment containing the horses, and every requisite of stable furniture is supplied. On one side of the building, and external to it, is a low sloping roof which covers in a space for carts, waggons, and the more cumbrous farm implements; and on the opposite side is a similar roof covering the styes of the pigs. Gates lead from the storehouse end of the building to the straw yard on the one side, and a meadow on the other.

It is in this meadow that the new distillery, for obtaining alcohol from beetroot, or mangoldwurzel, is built. The invention, here carried on with marked success, is due to Mr. Leplay, a French gentleman, but without such energy as Mr. Dray well knows how to devote, we feel confident we should have had to wait some years before its introduction into this country. In the first instance, the outlay of capital on buildings and plant was considerable; then permission from the Excise was necessary, and prejudices had to be overcome. At length the Excise Commissioners gave permission for one distillery, and decided to wait for proofs of its satisfactory working before allowing the erection of others. Mr. Dray thereupon erected his distillery at Farningham, and proceeded to work out the required results. The process of distillation is briefly as follows: After the roots have been washed and sliced, they are placed in vats, and there allowed to ferment for about twenty-four hours, fermentation being aided by the addition of sulphuric acid, and occasionally of yeast. The same liquor serves for many weeks. On being removed from the fermenting vats, the slices are placed in layers in cylinders, the layers being divided by perforated metal plates. After the cylinders are full, they are hermetically closed, and steam is admitted into the bottom of one of the cylinders. The steam extracts the alcohol from the slices in the first cylinder, thence passes into and through the second, and the alcoholic vapour is condensed by passing through a worm in cold water, being finally received in a spirit vat. While the first cylinder is emptied and refilled, the steam is made to traverse the second and third cylinders, so as to extract any alcohol which may still be contained in the slices of beetroot in the second, before passing through the freshly-charged cylinder. Steam is thus passed twice through each cylinder, the contents of which are exposed to its action until it is found that the whole of the alcohol is extracted. The spirit has a slight flavour, as may be expected in all raw spirits; but after rectification, this disappears. We understand a rectifying apparatus is to be fitted to the still, through which the spirit will pass before being received pure and tasteless into the spirit-vat. The quantity of spirit obtained is very great.

We have hitherto spoken of the spirituous yield only of the beetroot; but what renders the process infinitely more valuable

is, the fact that the pulp or steamed slices of the root, which are removed from the cylinder after the alcohol has been extracted, forms a most valuable food for horses, oxen, and sheep, the nourishing and fattening properties of which are at once perceived on inspecting the stock fed with it. Its estimated value is 15*s.* per ton. On a recent visit to Farningham, we saw some ewes and lambs which had been fed upon the pulp mixed with a small quantity of cut hay. The whole flock were in splendid condition; and so fattening is the pulp, that many ewes with two large lambs were quite fat enough for the butcher. On looking into the feeding-troughs we saw hay only, the whole of the pulp having been eaten.

The Government are so satisfied with the success of the beetroot distillery, the value of the pulp as a feeding agent, and the benefit the country is likely to derive from the introduction of the invention, that we understand they have decided on permitting twelve more distilleries to be erected, and for the construction of the whole of the necessary apparatuses for these Mr. Dray has already received orders. Mr. Dray may well pride himself on being the introducer of a branch of manufacture likely to be of immense benefit to the country at large; and we hope at the same time it will be found profitable to himself.

CUNNINGHAM'S SELF-REEFING SAILS.

The *Liverpool Telegraph* of May 11th contains a very sensible and truthful article upon Mr. Cunningham's admirable invention. After alluding to the importance of reducing manual labour on board ship, the writer states that Mr. Cunningham recently took his beautiful little brigantine, the *Alfred* (which is rigged throughout on his plan), into George's Basin, for the purpose of exhibiting the working of his system of reefing. "A number of influential gentlemen connected with shipping were present, who expressed themselves highly delighted with Mr. Cunningham's invention. His plan of reducing the area of the canvas by rolling the sail up on the yard (the yard being fitted to turn round on the fixtures for that purpose) is so generally known as not to require a description; but we cannot avoid noticing the beautifully mechanical principles, as exhibited on Saturday, which Mr. Cunningham has selected, or indeed discovered—for a discovery it is—to carry out his great object, and which may probably not be generally known. In his invention he employs the gravitation of the yard and its appendages to produce the necessary rotation of the yard by the action of the chain or halyards in the bight of which it is suspended, and which being hoisted upon or lowered (one end being a fixture) produces a rotation of the yard, thus constituting the operation a self-acting one. If Mr. Cunningham had not discovered this principle, the necessity of applying manual force to the rotation of the yard would have been a serious difficulty to the attainment of the desired object.

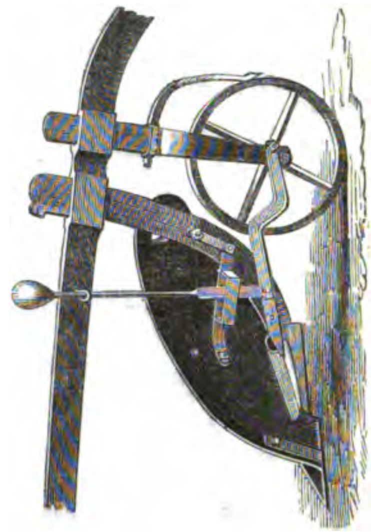
"We particularly noticed a most striking feature in the application of this invention. We allude to the arrangement of Mr. Cunningham's system of self-reefing to the working of the top-gallant sails in such a manner as to dispense with the use of royals, a feature which is well worthy of special notice. He employs, as shown on the 9th, a deeper top-gallant sail for the purpose, which, although not containing the collective area of the top-gallant sail and royal together, by being carried up square at the head and entire in its area, gives a powerful propelling sail, and is as effective as the two sails on the old plan. This large sail can also in a moment be reduced to a close-reefed top-gallant sail of the smallest size, and the weight of the royal yard, with all its gear, is dispensed with.

"The ability to take in and make sail so easily and quickly cannot fail to afford the means of making quicker passages. Indeed, the fastest passages on record have lately been made by ships fitted with Mr. Cunningham's system. The ship *Imogene*, which made the remarkable passage of only forty-seven days from Algoa Bay to England, was so fitted. The captain stated that the shortness of the voyage was owing to his being able to keep sail on his ship to the last moment, and apply it again on the least fall of wind. The advantages of making quicker passages—of saving in wear and tear of canvas—of the ability to proceed to sea with fewer regular seamen, meeting the growing want we have mentioned above—and the saving of life by Mr. Cunningham's arrangement—are considerations that have had, and to a still greater extent we trust will have, that weight with shipowners that the wants of commerce require. We would observe, in conclusion, that Mr. Cunningham's system of reefing is now applied to all new ships throughout the kingdom, and in Liverpool, with a just appreciation of its merits, its adoption is extending, and we can only express a hope that this valuable invention may, as we believe it will, become at last universal."

WOOFE'S PATENT LAND PARER AND TURF CUTTER.

Mr. W. Woofe, agriculturist, of Weston Birt, Gloucester, has patented an improved implement for paring land, which is applicable also to the removing of turf. For both purposes it is found to answer extremely well.

In its general construction the implement, which is represented in the annexed engravings, resembles a plough. To the fore part of the beam are connected, through uprights carrying axles, two wheels —one on each side. At the back of the beam is fitted a standard, which carries the axle of a third wheel. The axle is prolonged beyond the wheel on each side, and has forged or affixed to it two small cranks. Just before the hind wheel is fitted a curved bearer, which terminates at bottom in a share



or parer, and to the support is affixed a mould-board. To each of the cranks on the axis of the hind wheel is connected a rod, the other end of which is fixed to a scraper or clearer, which, on the rotation of the wheels, travels to and fro, and clears and scrapes the share and mould-board.

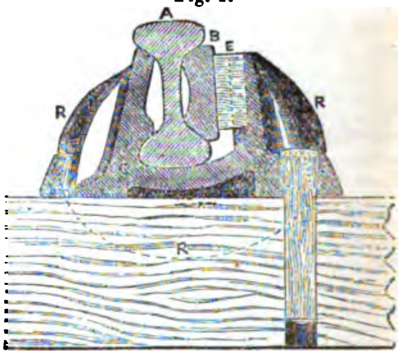
When the implement is regulated for the removing of turf, to a standard descending from the beam, just in the rear of the fore wheels, two cutters are fitted, one for cutting off the turf longitudinally, or in a line with that in which the implement is drawn, and the other for cutting it transversely, or in a line at right angles to that in which the implement advances. At bottom the cutter standard terminates in a bow, which carries an axle, upon one end of which is keyed a circular disc. On the axle, and between the bow, is affixed a cutter for making the cross cut. Upon the implement going forward the circular disc revolves, makes a continuous cut, and, carrying round the other cutter with it, causes it to cut once with every revolution of the disc.

PARSONS' PATENT RAILWAY CHAIRS.

The "Wedge Fish-Joint Chair and Intermediate Chair, with Iron Wedge and End Grain Wooden Cushions" of Mr. P. M. Parsons have lately attracted the attention of engineers and others interested in maintaining the permanent way of railways in a safe and efficient state at a small cost. The "Wedge Fish-Joint Chair" was contrived by the inventor for the purpose of combining all the advantages of a fish-joint, with the additional vertical and lateral support afforded by a chair, and by dispensing with bolts and nuts, avoiding much of the care and attention entailed by the ordinary fish fastened by bolts, at the same time reducing the cost of the permanent way.

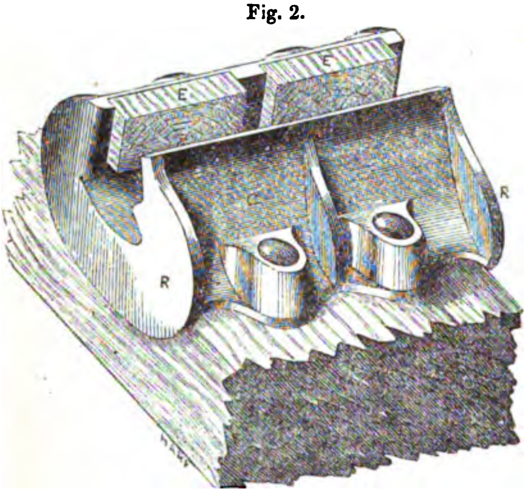
The accompanying engravings show the

Fig. 1.



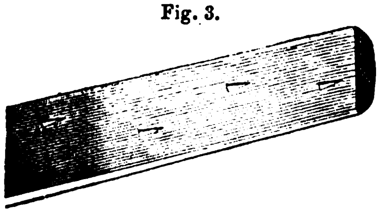
construction of the joint chair. Fig. 1 is a transverse section; fig. 2 an isometrical view with the rails and wedge-fish removed. A is the rail; C the chair: B the fish-wedge, which is driven into the chair between the rails and cushions of wood, E, placed in the chair, and cut so that their end grain will come against it on one side and the jaw of the chair on the other. The chair is made rather wider than the sleeper; and in addition to the side ribs usually employed is provided with strong ribs, one at each end, continued from the sides all round the bottom, which serve to bring the whole of the sole of the chain into tension when the strain caused by driving the wedge is put upon it, and thereby add materially to its strength.

Fig. 2.



The back of the wedge-fish is provided with jags or barbs, seen in the isometrical view, fig. 3. When the wedge is driven into the chair, the pointed ends of the jags or barbs force aside the fibres of the end grain wooden cushions, which, after their passage, close up behind them. The jags thus become embedded in the cushions, and prevent the wedge-fish from working out of its place. It will be seen that the joint is effectually fished by the chair and the wedge-fish. It is considered by the inventor that the arrangement possesses quite as great or greater power to hold the parts together as that provided by the four bolts on the ordinary fish-joint. It has been ascertained, he states, that a pressure of ten tons can, by driving in the wedge-fish, be put on the chair with ease and safety, and that it will take four or five times this strain to burst the chair, or crush the end grain cushions. This is, we think, as much as four $\frac{7}{8}$ in. bolts would bear, and considerably more, if their threads were not exceedingly good, the nuts well fitted, and the surfaces square and true, which they seldom are.

Fig. 3.

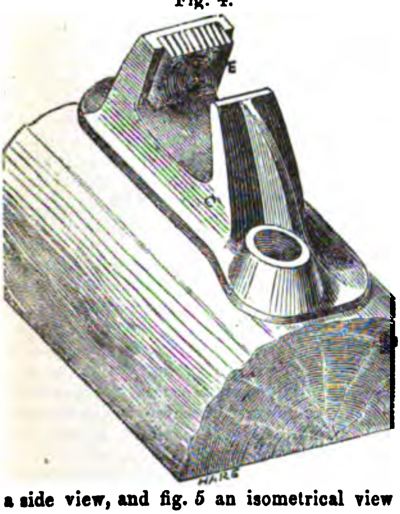


The elasticity derived from the wooden cushions contributes in a great measure to preserve the chair and enable it to resist the sudden shocks and strains to which all

parts of the permanent way are liable. By placing the wood endways of the grain, this advantage is secured, without the liability to shrink which wood is subject to when used in the ordinary way; for wood, however unseasoned, will not shrink materially endways of the grain, even when exposed to the most extreme atmospheric changes. This valuable property Mr. Parsons has turned to practical account. The operation of making good the improved fastening, or of tightening it, if required, is simple, being performed solely by the hammer—a more speedy operation, and one which platelayers understand better, and would be less inclined to shirk than that of stooping down to fit in and screw up bolts with a spanner. On the point of renewals this system bears favourable comparison, we think, with any plan of joint depending mainly on bolts and nuts. The only parts likely to require renewing are the end-grain wooden cushions; the durability of these is, however, great, as they are creosoted, and both ends are, to a great extent, protected against moisture by the chair and the wedge-fish. "From the experience of their durability that has been obtained up to the present time, it may fairly be assumed," says the inventor, "that they will last at least three times as long as the bolts used in the ordinary fish and similar joints. It is known that these require replacing after a few years, and the cost of doing so is considerable; but the cost of renewing the wooden cushions scarcely amounts to one-twentieth of the cost of renewing the bolts, even supposing they only lasted the same time."

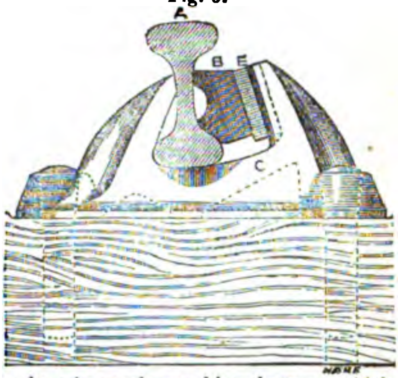
The intermediate chair, of which fig. 4 is

Fig. 4.



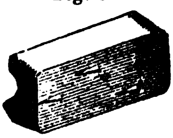
a side view, and fig. 5 an isometrical view with the rail and wedge removed, is, so far as the fastenings are concerned, the same in principle as the joint, being fitted with an

Fig. 5.



end grain wooden cushion, between which and the rail an iron wedge provided with jags or barbs, fig. 6, is driven. It is, how-

Fig. 6.



ever, somewhat different in form, as it is designed to effect different objects, the chief of which is to hold the rail firmly down on its seat, and thereby prevent the hammering and consequent indenting of the under table of the rail, so that when the upper table is worn out the rail may be reversed, a result which, though often contemplated, has seldom been effected in practice. This is accomplished by giving to the side of the chair, C, which receives the cushion, E, an inclination, so that when the iron wedge, B, is driven in, it presses down against the lower table of the rail, as well as sideways against its web; the rail is thus forced against the opposite jaw and down on its seat on the chair; and so long as the wedge is tight, the rail must inevitably be kept fairly on its seat, and this will still be the case if the rail is reversed and its arm table placed in the chair. We are informed that the system has been tried, given great satisfaction, and been further adopted on the Great Northern Railway, on which a small portion was first laid down nearly two years and a half since. It is also being used throughout the whole of the East Kent Railway, and portions of other lines have also been, and are about to be laid with it—amongst others, the Eastern Counties, South Western, and South Wales.

STEAM NAVIGATION AND NAVAL ARCHITECTURE.

To the Editor of the Mechanics' Magazine.

SIR,—Our late correspondence on the subjects of "Steam Ship Capability," and "Tonnage Registration," especially as respects the practical application of the formula

$$\frac{V^3 \times (\text{Displacement})^{\frac{2}{3}}}{\text{Ind. horse power}} = C$$

was so full, and I had hoped so conclusive, that it is with regret that I find my name again brought forward in your editorial article on Mr. Armstrong's paper on "Steam Navigation and Naval Architecture," in *Mechanics' Magazine*, No. 1761.

I cannot admit that I have "*squeezed out of this simple formula a great deal more than experience will fairly warrant*," for your present article aptly brings forward and confirms almost textually in my own words all that I have advanced in exposition of the practical application of the formula referred to: And again, I cannot admit that "Mr. Atherton has damaged a good cause by his onslaught upon the Mercantile Shipping Act of 1854." For, consequent on this "onslaught," the *Mechanics' Magazine* has editorially proclaimed the three glaring deficiencies of the Registration under the Merchant Shipping Act of 1854; viz., 1st. That the registered tonnage of a ship under the Act of 1854, affords no data either of the load displacement of a ship or of the tons weight of cargo that a ship will carry.

2nd.—That the Registration under the Act of 1854 affords no protection against overloading, either by registering the builder's load-line or by enjoining the recording of the draught of water at which ships actually put to sea.

3rd.—That although the registration of the "horse-power" of steam ships is prescribed by the Act, neither this Act nor any other Act nor practice of trade defines what is *legally* signified by a "horse power."

The expositions in my paper read before the Society of Arts in May, 1855, merely drew attention to these deficiencies of registration, and to the anomalies to which they gave rise. My subsequent paper, in January, 1856, and consequent correspondence, which you are pleased to designate an "onslaught on the Act of 1854," was in refutation of the arguments by which it had been attempted to defend and uphold the Act. All this discussion is on record in the pages of the *Mech. Mag.* and *Society of Arts Journal;* and it will be observed that the registration of shipping under the Act of 1854 does not embrace either one of the elements of the formula now recognised by your editorial article as of such essential importance to the directorial management of shipping, that, as you justly observe, "In the direction of all steam navigation companies, there ought to be at least one person of sufficient scientific attainments to be charged with the responsibility of making these calculations." In short, by your own showing, the registration under the Act of 1854 is so deficient in the three points above specified, as well as useless as a means of facilitating the practical application which you advocate of the formula referred to, that to call it a system of registration, and to pretend that it is complete, is an imposition on public credulity, productive of the monstrous mischief of constantly causing steam vessels to be assigned to services for which they are not fit. "*What's your Index Number?*" is the most vital of all questions that can be put in regard to the dynamic merits of the constructive type of a steam-ship; and our registration data under the Act of 1856 should be so amended as will aid in the solution of that inquiry.

I am, Sir, yours, &c.,

CHAS. ATHERTON.

Woolwich Dockyard, May 11, 1857.

To the Editor of the Mechanics' Magazine.

SIR,—Considerable misconception appears to prevail as to the intended uses of the formula proposed by me, which I will endeavour to remove as briefly as possible. The object of the formula is to supply a standard of comparison, to test the progress of steam navigation in every branch, and to mark that progress by a co-efficient that can be expressed in a term that may be understood. The specific gravity of bodies is measured from the standard of distilled water, the length of an object by the foot, the weight by the pound, and the power of the steam engine, by 33,000 lbs. raised one foot high in a minute; but in steam navigation, a vessel goes on her trial trip, and has exceeded every one's expectation. Now, the real uses of my formula is to exhibit how much have those expectations exceeded the laws of nature, mechanics, or hydrostatics. The standard proposed by me is based upon the propelling power increasing as the square of the velocity, which is denied; the prevailing opinion being that the propelling power increases as the cube of the velocity; but whichever is the correct principle, let a common standard of comparison be conceded, for without one the progress of naval architecture cannot be recorded, the most available standards being as follows, for the two principles:

V^2 E. H. P.	V^3 E. H. P.	Mid. Sec.	V miles.
64	51·2	100	8
81	72·9	100	9
100	100·0	100	10
121	133·1	100	11
144	172·8	100	12
169	219·7	100	13
196	274.4	100	14
225	337·5	100	15
256	409·6	100	16

As an example of the working of these standards, the *Himalaya* went on her trial trip, and her velocity was 15·88 miles, midship section 560, and ind. horse power 2050, and which was pronounced a most surprising performance; above what? if a fuel could be discovered that 1 lb. could evaporate 16 lbs. of water, it could be recorded that its evaporating power was 100 per cent. superior to Bate's West Hartley, &c. Now, by means of these standards, the *Himalaya* barely fulfilled the conditions of the square standard, but exceeded the conditions of the cube standard 16 per cent.

The *Minx*, diminished, went on her trial trip, midship section 82, ind. horse power 31·6, and velocity 5·15 miles; in this example, the *Minx* exceeded the conditions of the square standard 1 per cent., but, by the cube standard, did not fulfil the conditions by 19 per cent.

These two examples furnish the most powerful argument that the propelling power increases as the square of the velocity. When the superiority of the *Himalaya* 16 per cent. can be attributed to her form of water lines, or the superiority of the engines and propeller, and the inferiority of the *Minx* 19 per cent. be attributed to the bluff bow, bad engines (high pressure), and propeller, then we may receive the theory of the propelling power increasing as the cube, the true principle.

The maintainers of the cube theory cannot object to my proposed cube formula; it is merely the old formula of the midship section, with a CONSTANT coefficient, to test the superiority of the vessel for speed. The *Rifleman* (diminished), *Dauntless*, and *Fairy*, being the standard.

My objections to the formula $\frac{V^3 D^{\frac{2}{3}}}{I\,H.P.}$ as a rule for the requirements of any rate of velocity, or as a means for testing the commercial value of a vessel, with your permission, shall form the subject of a subsequent communication.

I am, Sir, yours, &c.,

ROBERT ARMSTRONG.

11, Mercer's-terrace, Salmon's-lane, Limehouse, E.

[MR. ATHERTON exhibits an extraordinary degree of sensitiveness whenever his name happens to be mentioned in connection with the several subjects on which he has written so voluminously. It is surprising, perhaps, that we should quote his labours when experience has shown that he is ever ready to return to the attack.

" Atherton *expellas furcâ, tamen usque recurret.*"

We have, probably, put down many of our correspondent's observations at more than their intended value; and this will account for our supposing him to have attempted to " squeeze more out of a simple formula than experience will warrant." If Mr. Atherton, in his several publications, means no more than we attempted to place before our readers, in a few words, in number 1761 of our Magazine, we have nothing more to say on this subjecf; but to express our satisfaction at finding that his " *verba sesquipedalia* " and our simple Saxon have so much meaning in common.

With regard to his " onslaught on the Mercantile Shipping Act of 1854," we are not to be beguiled into another dissertation on this "*quæstio vexata.*" Our correspondent seems to think that the mere repetition of propositions gives weight to them. He has a knack of looking right over the point of the question and letting his eyes expatiate, very much to their satisfaction, on the fair prospect on the other side. It has never been a question whether certain possible objects of registration are omitted in the Mercantile Shipping Act of 1854; but whether it is advisable that the Legislature should enforce such a registration. It is, therefore, merely puerile to claim our sanction to his own views on this matter, by parading the admitted " deficiencies " of the registration under the said Act.

No one has ever said that the registration is " complete." The real point at issue between Mr. Atherton and ourselves—which that gentleman very conveniently overlooks—is, whether it is the business of Government to enforce a complete registration; whether the gain in such case would not be much more than counterbalanced by the inconvenience and mischiefs arising from it.

No one single argument has ever been adduced by Mr. Atherton to support his view of the case, namely, that a " complete " registration ought to be enforced. In our remarks, in our 1761st number, we made no reference whatever to a Government

registration. Mr. Atherton labours under a sad confusion of ideas, if he supposes that an admission that "in the direction of all steam navigation companies there ought to be at least one person of sufficient attainments to be charged with the responsibility of making certain calculations," is tantamount to an admission that a Government ought to interfere to secure this very desirable object. We think all matters of trade and commerce, including steam navigation, are best left to the regulation of the persons interested in them, except so far as interference by Government is absolutely necessary. For Government to undertake such a control of steam enterprize as to obviate the "monstrous mischief of constantly causing steam vessels to be assigned to services for which they are not fit," would be as monstrous as for Government to undertake the management of private banking establishments, and to prevent the managers from entering into this or that speculation, which would probably turn out a failure.

It is one thing to recommend to companies or individuals the adoption of a particular course in the management of their affairs, which we believe will turn out to their advantage; it is quite another thing to attempt to enforce the adoption of this course by legislative enactment, even if it were possible to do so, which we more than doubt. Persons embarked in a shipping enterprize are necessarily possessed of ALL the information with regard to their own vessels, on which a calculation of their efficiency may be based; and it is quite within our province to recommend to them the means of turning this information to the best account. But to require the registration of all these several items would be very properly resented as inquisitorial in the extreme, would lead to evasions and equivocations very injurious to public morality, and would render the enforced registration of little value in a commercial or scientific point of view. Freedom is the atmosphere in which British enterprize always has thriven and always will thrive best.

Mr. Atherton, following his usual instinct, works himself up into a fit of virtuous indignation against the "registration under the Act of 1854," which he "denounces as an imposition on public credulity." Like most gentlemen, however, whose forte is indignant declamation, he quite overlooks the logic of the case: hence much of his eloquence has been thrown away; for we have never pretended that the registration under the Act of 1854 is "complete"—have never believed that any system of registration consistent with the interests of commerce can be made useful "as a means for facilitating the application of the formula" which we have advocated. And although we allow that the determination of the "index numbers" should be a most important object with all who wish to make steam navigation pay, and urge upon such persons a due regard to this important object, we utterly dissent from the conclusion that "our registration data under the Act of 1854 should be so amended as will (to?) aid in the solution of that inquiry."

We have inserted Mr. Armstrong's letter, because we think it fair that a gentleman whose views we have impugned should have an opportunity of explaining himself in his own way. Our readers must take it for what it is worth. The logic of the writer seems to be of a most extraordinary kind, and leads to the most unexpected conclusions. It seems that the fact of the existence of certain definite standards of specific gravity, length, and weight, have inspired him with the brilliant idea of constructing a formula to exhibit how much the performances of a vessel which, on her first trial, exceeded expectation, "*exceeded the laws of nature, mechanics, or hydrostatics!*"

We need hardly say that the *standards* to which Mr. Armstrong refers his vessel are merely ideal. The two formulæ which he constructs for his comparison in the square and cube theories are merely empirical, and possess no intrinsic value whatever.

In order to show that the theory of the cube is inadmissible, a comparison must be instituted between the horse powers applied to the *same* vessel to produce different speeds, and not between the result of a single trial of a vessel and a "standard" empirical formula. It could hardly be supposed to enter into the head of a gentleman whose logic is of such a cast, to suspect the superiority of the *Himalaya* or the inferiority of the *Minx*—measured by his particular standard—to arise from any advantage or disadvantage of the *form* of the vessel itself; in other words, to suppose that the *constant* or "index number" of the vessel would be greater or less than his standard constant. The *Himalaya* is a vessel of very great length, and her displacement is much higher, compared to her midship section, than that of any previous steam-vessel. If she on her trial so much exceeded expectation based on the usual formula, the rational inference would seem to be that her form is better adapted to the conditions of speed than that of any of her predecessors, and not, certainly, that her performance "exceeds the laws of nature!"

The very thing that the maintainers of the cube theory do object to as inconsistent with the laws of nature is the "proposed" cube formula, and that for the very reason which it seems recommends it to Mr. Arm-

strong, viz., that it is the "old formula" with a *constant* coefficient. Except in the case of an exact similarity, the index for different vessels cannot be *constant*. If it were, it would lose all value as a standard of comparison for vessels of different types of build.

Having commented not in very favourable terms on Mr. Armstrong's labours in this department of science, we cannot debar him of the privilege of attempting to set himself right in our columns. Should we hereafter insert without comment any further letter of his (and we cannot help requesting him to be brief should he write again), we must guard against the possible mistake that we are in any way converts to his notions.—Ed. M. M.]

THE CONSERVATION OF FORCE.

[For special reasons we are induced to publish the following letter.]

To the Editor of the Mechanics' Magazine.

Sir,—After reading the four pages of remarks with which my opponents have honoured my communication, on the subject of the "Conservation of Force," I am happy to find that I could better your instructions to write in reply with all possible brevity, by not writing at all, so far as any answer is required, for nowhere can I find anything tangible to grasp; there is not a single argument advanced on their side of the question, nor the slightest attempt to rebut any on mine. As to joining in with wordy personal warfare, your readers would not thank me for that, nor will I descend to it. The few observations,therefore, which I shall make, will be of an explanatory kind, for the purpose of obviating misconceptions, and with the view, in intention at least, of contributing something towards the extension of sound knowledge on this and other related subjects.

It is objected to Faraday as well as to myself, that by applying the word force to momentum and inertia, we use it in a vague indefinite sense, and so put ourselves out of the pale of philosophical, or at least mathematical discussion. That such a use of the term should be considered vague, will very naturally appear to be the case, to any one who contemplates the idea of force only from the narrow and limited mathematical point of view,—to any one who does not perceive, that wherever phenomena exist, of whatever kind, there force is present to produce them, whether it can be mathematically detected and measured or not,—to any one who does not acknowledge that force is a *genus*, having several *species*, or distinct modes of viewing and appreciating it; and who does not perceive therefore the right which the philosopher undoubtedly possesses, both in his own character and in that of a logician, to use the word in a general sense, that is, as a *generic* term, and to make *special* application of it as occasion may require. It is unfortunate, however, that there is not a word in use, to designate expressly and exclusively the general idea of force, and so relieve it of what is unnecessarily vague about it; but this is not the fault of the philosopher, but of the language. The word "power" could be so employed, but it is not the custom, and would not be free from ambiguity.

But after all, a *general* word must, from its very nature, and by a logical necessity, be always vague and indefinite; definitiveness results from descending to particulars. In order, therefore, to acquire precision, we qualify the *general* word, by appending to it others indicative of its special aspects. Hence we have, according to the old terminology, live forces and dead forces; but following, more exact and scientific distinctions, we have the force of momentum; the force of impetus or energy, more commonly known under its Latin name, the *vis viva*; the force of pressure; and the mechanical force, known to practical men as work and duty. These several forces, susceptible as they are of mutual transformation, have each their own appropriate measure, which will not admit of indiscriminate use—a circumstance, however, which mathematicians, intent upon only one or two descriptions of force, have often forgotten, and have been led thereby into many errors of a practical kind. There are again other species, or varieties rather, of force, which are not distinctly characterised by particular measures, but by the manner in which they manifest themselves; such are the forces of attraction and repulsion; the force of percussion; the elastic force; the centripetal and centrifugal forces; the projectile force; and the force of inertia. Many of these forces, and others which might possess distinguishing names, are substantially the same, differing only by slightly varying circumstances. Now, through all these manifestations, the general idea of force as a cause or power, runs—unless we choose to go back in our notions, and attribute some of them to occult qualities in bodies. The philosopher has them all in his mind when he speaks simply of force. Even the mathematician's definition is wide enough to embrace them all—"force is that which alters or *tends* to alter a body's state of rest or motion." But, here I would remark, that if the full idea of force should not be included in a definition, it would be very unphilosophical to make it bend to our own

artificial limits, instead of altering the definition itself.

It is not correct, then, to say "that momentum and force are essentially distinct ideas," though simply distinct they certainly are, just as space and distance are distinct ideas; but only after such a manner that as we can say distance is space, so we can say momentum is force. Distance is space itself in its relation to two bodies, and momentum is force itself in its relation to two other ideas, mass and velocity; it is simply force in definite measuring terms, as distance would be of space if more specifically described as yards. Now measured in one way by the product of the mass and the velocity, force is distinguished as momentum; measured in another way by the product of the mass and the square of the velocity, it is called the *vis viva;* and here how noticeable it is that logic and philosophy will occasionally make themselves heard, in spite of narrow mathematical notions and prejudices, constraining even mathematicians themselves to recognise a force "a *vis*" under one mode of measurement, though inconsistently rejecting it as to the other. Some mathematicians also, but I am afraid they are philosophers, attribute a "*vis*" to inertia, and speak of it as the "*vis inertiæ*," whilst others repudiate such a notion, and yet continue inconsistently to talk of a "centrifugal *force*." The reviewer of Faraday's lecture, whilst taking him to task for conceiving force to reside in inertia, would, however, with more consistency assert that in "centrifugal force" also the term is improperly applied.

Well, as there is nothing in mathematics, it seems, that will reconcile these different opinions, there is no help for it, as I can see, but to call in that philosophy, which is considered such an intruder, to decide the question, and little doubt is there as to which side it would take. If, then, mathematicians differ as to the fundamental truths of their own science—truths which, necessarily as first principles, philosophical and not mathematical investigation can alone elucidate, is it not too bad that philosophers should be warned off as trespassers when only exercising their undoubted manorial rights and privileges? but it is worse than bad that they should be stigmatized as poachers when the ground upon which they stand is all their own; and undeniably this is the case when attraction and the primary truths of natural philosophy, and not of mathematical science, are concerned.

The mathematician has conquered most of the difficulties attending the investigation of the motions of bodies *in the mass*—at least when not complicated by too many influences, the problem of the three bodies having been a nut which it took a century to crack; but if he hopes to assist philosophers in their experimental inquiries into *molecular* actions, by giving some degree of determinateness and measurability, if possible, to their results, so far at least as the present state of his calculus will carry him, he must study well what Playfair calls "the *philosophy* of mechanics in the leading truths of the science of motion;" he must see to it that his fundamental notions of force are correct before he ventures to approach more nearly its fountain source; he must welcome, rather than disdain, the clearer conceptions of truth as to these points which philosophers are better qualified than himself to educe. The mathematics is rather an art than a science, and philosophy underlies that and all other arts. Not only do its truths form the foundation of mathematics, but it is competent to afford assistance in the progress of the mathematician's own investigations, just in a proportional degree as they become mixed up with physics, especially the physics of molecular action. The chain of conclusions as to its separate parts may be indissoluble in its connections; but portions of it may have been linked together by pure philosophical considerations; and here the mathematician is apt to be at fault.

A notable instance of mathematicians coming to grief in this manner did Euler present, when his analysis led him to the monstrous conclusion that a pile of materials, however high, could not be crushed by its own weight. Methinks a very slight amount of philosophy, in its lowest grade of common sense, should have withheld him from such a result, or induced him to abjure it as soon as it appeared. We may be well assured that so profound an analyst, and so expert a manipulator of his symbols, committed no working error in the practice of his art; but he failed at some place in the connection of his links, where *ideas* were the materials with which he had to work, and a little philosophical reasoning their tie. Do your readers require to be reminded of the egregious error which I not long since pointed out as being retained in all scientific works, concerning the point from which the power of the oar is to be calculated? And many more errors there are, which I hope you will some day allow me to expose and prove, as in long past years I have in many instances done, arising from the want of that philosophical acumen in which the mathematician so often fails.

This mental deficiency, though partly natural and partly superinduced by the very tendency of mathematical studies, prevails no doubt more extensively than it

might do, because the teachers of the science, as Le Sage remarks in his letter to the Duke de Rochefoucault, "are in haste to give a few notions, rather grammatical than intellectual, of the sublimer parts before they have sufficiently developed the elements." What says on this point the report made by the Board of Mathematical Studies to the Senate of the University of Cambridge? "That the mathematical tutors should direct the attention of students to the necessity of giving definitions and explanations of fundamental principles completely and fully; for that in respect both to elementary dynamics and astronomy the papers even of the more distinguished of the candidates have frequently exhibited a want of clearness of conception and of habits of close and accurate thought." No wonder that in after life, although in the interval there may have been an assiduous study of the superstructures of the science, a want of a philosophical appreciation of kindred subjects should be a matter of reproach; such, for instance, as might be exhibited by a denial, as the result of *calculation*, of the possibility of steam navigation to America. Nor is it any wonder that such persons should be indisposed to accept assistance at the hands of the uninitiated in acquiring those clear conceptions which, though of rudimental knowledge, are indispensable for the *progressive advancement* of science, and without which men will slumber at their posts, the conservatives of science, though not of force.

With respect to Faraday's conceptions of "lines of force," I beg to inform you that they have been made the subject of mathematical investigation, by a distinguished Cambridge mathematician, and now a professor of mathematics elsewhere; and I am enabled to say from reliable information, that they stand such investigation as well as any of the accepted theories depending upon action inversely as the square of the distance: and that they include under one view more than they do; he has reason to believe they contain a truer and more general representation of the force or forces of electricity, magnetism, &c. This paper will appear in the Cambridge Philosophical Transactions.

The length of this communication warns me, that any observations which I may wish to make on the conservation of force, must be deferred to another time; but I am desirous of taking this opportunity, in justice both to Professor Faraday and myself, of stating, what before I had overlooked, that he calls his "lines of force" *physical* lines, and that in the lecture which has been the subject of criticism, he says "that gravitation may possibly act by lines of force *of definite amount*." This view of the subject then, if I understand the matter aright, will not, I conceive, be found to differ substantially from what I have described as radiation *in space*, as distinct from radiation *in lines*. It appears to me, to be analogous to that case which I have put, of a radiating emission of projectiles in the shape of a discharge of small shot in a vacuum. Thus the law of the inverse square of the distance, as seen in gravitation, as also in the action of these projectiles, will not appear as the primary attribute of the attracting force, any more than it does of the force of momentum in the shot; but only as the necessary result of the finite conditions under which both these forces act. Thus Faraday has at least proposed the means for the solution of the difficulty, if indeed he has not himself solved it, as it appears to me he has in the following passage quoted from a lecture which he delivered in the year 1855:—

"The third sub-case remains, namely, that the power is always existing around the sun and through infinite space, whether secondary bodies be there to be acted upon by gravitation or not; and not only around the sun, but around every particle of matter which has existence. This case of a constant necessary condition to action in space, when as respects the sun the earth is *not* in place, and of a certain gravitating action as the result of that previous condition, when the earth *is* in place, I can conceive, consistently as I think with the conservation of force; and it is, in philosophical respects, *the same* as that admitted by all in regard to light, heat and *radiant phenomena*." And subject therefore to the same mathematical deduction which evolves alike for each the law of the square of the distance, without assigning to distance itself, purely as distance, any influence at all.

I am, Sir, yours, &c.,
BENJ. CHEVERTON.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

TEMPLETON, A., and J. LAWSON. *Improvements in the manufacture of pile fabrics.* Dated Sept. 19, 1856. (No. 2200.)

This consists in attaching chenille or other fabric to a back of woven or other fabric by sewing or cementing.

YOUNG, W. *Improvements in furnaces, fire-places, and stoves.* Dated Sept. 19, 1856. (No. 2202.)

To supply air to the fuel a tube is used, which passes up through the centre of the grate, and supplies air through a series of longitudinal slits. The tube is closed at the centre of the fire by a plate, so that the

air to supply the lower part of the fire is drawn from below; and the air to supply the upper part from above. Underneath the fire is a cylindrical box for containing fuel, and the fuel is raised as required by a screw which nearly fits the cylinder. Another method consists in mounting the fire basket or grate on a vertical axis, and in dividing it at the top into two, three, or more divisions. Over the fire basket a plate projects, which covers one or more of the divisions. When the fire requires feeding, fuel is placed on the uncovered part of the fire, and then, by rotating the grate, the fresh fuel is carried under the plate, and the smoke is obliged to descend, and to pass under the divisions, and up through the bright fire.

FINCH, E. *Improvements in the construction of wrought iron masts, bowsprits, booms, yaffs, and spars, and in rigging ships.* Dated Sept. 19, 1856. (No. 2203.)

These consist—1. In making wrought iron masts, bowsprits, &c., multilateral in sectional shape. 2. In doing away with the necessity in masts, bowsprits, &c., of putting in the rivets from the inside, and holding them up while being riveted, by using a rivet which is clenched on both sides in tapered holes. 3. In facilitating the construction of masts, topmasts, &c., by inserting in the ends of them, or into any part of the barrel where holes have to be made, pieces of wood, which, previous to insertion, have been reduced by compression, so that in their endeavour to resume their original shape they shall tighten, and firmly fasten themselves in the iron barrel. 4. In a method of arranging the shrouds in rigging ships.

UNDERWOOD, J., and F. V. BURT. *The manufacture of copying inks for printing.* Dated Sept. 19, 1856. (No. 2206.)

This invention was described at page 415 of No. 1760.

RAMMEL, T. W. *Improvements in constructing railways and propelling carriages thereon.* Dated Sept. 20, 1856. (No. 2213.)

These improvements are for making railways through cities and towns. The railway in each case is to be supported by columns at such a height that the carriages thereon may be above the heads of persons on the foot pavements. Each line of rails is endless, and at uniform distances there are stations, which will, in most cases, be the present houses arranged for passengers to enter from the foot pavements, and to ascend suitable stairs and pass out at the first floor on to a platform.

ROBERTS, J. *A new or improved railway chair.* Dated Sept. 20, 1856. (No. 2214.)

The new chair consists of two parts, one fixed and the other moveable, the moveable part engaging with the fixed part by a dovetail, and being fixed in place by a wedge-shaped pin or cotter, or jagged spike or pin passing through the moveable and fixed parts.

FORD, A. *Improvements in dissolving vulcanized india rubber for waterproofing and like purposes.* Dated Sept. 20, 1856. (No. 2215.)

The patentee reduces vulcanized india rubber to small pieces, and afterwards soaks it in oil of turpentine or naphtha spirit. They are then transferred to boilers fitted with still heads and having steam or hot water jackets to heat them, and being supplied with rotary stirrers. After being heated and stirred for some time, the india rubber becomes completely dissolved, and the process continues until a sufficiency of the oil of turpentine or naphtha spirit or other solvent has distilled over, and been recovered for after use. The dissolved rubber is then drawn off.

SAYER, G. W. *Improved machinery for stopping or retarding railway carriages.* (A communication.) Dated Sept. 20, 1856. (No. 2216.)

The breaks are carried in pairs by rigid arms, supported at their ends by guides formed in a rectangular frame, which is carried by the axle boxes, and is thus independent of the carriage framing, and not affected by the vertical movements thereof. These arms have tapped sockets to receive a screw shaft, with right and left handed threads to draw the blocks against the wheels.

BLACKWELL, T. E. *An improved mode of constructing fire flues and air passages.* Dated Sept. 20, 1856. (No. 2217.)

The patentee employs hollow bricks of fire clay moulded into a rectangular figure in plan on the outside, and with the internal angles of the spaces filled up. These blocks he so proportions that they will readily bond with ordinary bricks, and prevent the necessity for filling up the spaces with bats and rubble when built into a wall.

TAYLOR, W. *Improvements in the conversion of cast iron into steel and malleable iron.* Dated Sept. 22, 1856. (No. 2218.)

This consists in treating molten cast iron by streams of hydrogen gas or sub-carburetted hydrogen gas, applied under or driven into the midst thereof, and allowed to escape from the surface.

MUSHET, R. *Improvements in the manufacture of iron and steel.* Dated Sept. 22, 1856. (No. 2219.)

To purified cast iron, when wholly decarbonised, or nearly so, by the action of air forced into it, the patentee adds a triple compound containing iron, carbon, and

manganese, by preference in a molten, fluid, or heated state, so that it may be mixed with the fluid cast iron.

MUSHET, R. *Improvements in the manufacture of iron and steel.* Dated Sept. 22, 1856. (No. 2220.)

To produce malleable iron the patentee purifies the cast iron by streams of air, decarbonising it thoroughly, or nearly so, and then adds a quantity of metallic manganese to the molten purified iron. To produce cast steel he sometimes arrests the purifying process, so that the iron may be merely decarbonised, until it contains only such a per centage of carbon as to constitute cast steel, and he then adds the metallic manganese to the molten cast steel. Or, he adds to the purified cast iron, when thoroughly decarbonised, or nearly so, the best or purest cast iron obtainable.

MORRISON, J. *A new or improved penholder.* Dated Sept. 22, 1856. (No. 2223.)

In this pen-holder the pen is grasped between the inside of a tube and an internal slide which moves obliquely.

WALLACE, T. *Improvements in the manufacture of wheels, axles, and axle boxes.* Dated Sept. 22, 1856. (No. 2224.)

1. In the improved axles the patentee makes their ends, round which the wheel and box rotate, of a conical form. A spiral or longitudinal slot is cut along the spindle to allow the oil to lubricate it. 2. In the axle boxes, he forms the box or casing to the spindle of two pieces of metal cast symmetrical, and so as to have their inner surfaces of a similar form to that of the spindle of the axle, having, if necessary, flanges to bolt them together, thus forming a complete box, (or he forms it of three parts somewhat similarly arranged). 3. In the wheels, the patentee proposes to construct the stock or nave of iron; the structure of the nave or stock, and the spokes, tire, and felloes, requires reference to engravings.

TAYLOR, J. G. *Improvements in fastenings, connectors, and couplings, and in the application thereof.* Dated Sept. 23, 1856. (No. 2225.)

These consist in the application of springs, hooks, &c., used in conjunction with rings, cords, chains, oeillett holes, and other arrangements.

WRIGLEY, F. *An improved friction coupling for the transmission of motive power.* Dated Sept. 23, 1856. (No. 2227.)

This consists in the arrangement of powerful levers directly applied to a frictional surface in motion, by which means it is brought gradually into contact within another and similar surface at rest, and thus held by the same levers.

HUSBAND, R. *Certain improvements in the manufacture of silk hats.* Dated Sept. 23, 1856. (No. 2229.)

1. Stiffening with solutions of shellac, for use in the silk hat manufacture, cloth in longer lengths than heretofore. 2. The application of rollers to proofing with solutions of shellac woven fabrics to be used in the manufacture of silk hats. 3. The application of cylinders to the drying of woven fabrics proofed with solutions of shellac for use in the manufacture of silk hats. 4. The application of cold friction to produce brilliancy upon woven fabrics proofed with solutions of shellac. 5. The construction of bodies with their internal surface such that hats having those bodies will not require lining.

NEWTON, A. V. *Improvements in gimlets, augers, and other tools which operate by a rotary motion.* (A communication.) Dated Sept. 23, 1856. (No. 2230.)

This relates to the application of certain ratchet wheels to the stock or handle of augers, gimlets, screw-drivers, &c., for imparting rotary motion thereto.

JOHNSON, W. *Improvements in machinery for doubling and twisting fibrous materials.* (A communication.) Dated Sept. 23, 1856. (No. 2231.)

These consist in keeping the threads separate from each other, until they arrive at a certain distance from the flyer where the greatest twist is obtained, at which point they are allowed to join and are twisted together. Another improvement consists in giving an increased amount of tension to the threads during their passage to the spindle, by causing them to pass through the feed-rollers, and then back again round a glass guide or tension bar, from which they repass through the rollers, and proceed to the spindle,

BAYLIS, A. G., and J. GREEN. *An improvement or improvements in the manufacture of needles.* Dated Sept. 24, 1856. (No. 2232.)

After the eyes of needles have been made in the ordinary manner, the inventors thread a number of needles upon a wire, which they roughen by a file. They place the needles thus strung upon a wire in a holder, the needles being held firmly. An alternating motion is communicated to the wire by mechanical means. They raise or lower from time to time the holder carrying the needles, so that the wire, which always moves in the same line, may sometimes operate on the tops and sometimes on the bottoms of the eyes. By this treatment any burr or other projection in the eye is removed.

BARRIE, A. *A new or improved instrument or apparatus for registering the time at which workmen arrive at and leave their place of work, and for other such like purposes.* Dated Sept. 24, 1856. (No. 2233.)

This consists of a circular box turning upon a vertical axis, and divided into a series of compartments situated radially.

The box is in a case, in the top of which is an opening or tube, into which the workman in passing drops a ticket or check. The box is so connected with a clock fixed on the case that at the required interval of time the wire is moved through a distance equal to any one of its divisions.

COTTRILL, J. *Improvements in machinery to supersede hand labour in the operation of filing.* Dated Sept. 22, 1856. (No. 2235.)

This invention requires engravings to illustrate it.

NEWTON, A. V. *Improvements in carding engines.* (A communication.) Dated Sept. 24, 1856. (No. 2236.)

This consists in the application of strippers to the main cylinder, in connection with a doffer which returns the cotton instantly to the main cylinder, whereby an uninterrupted action is preserved, not productive of unevenness of lap.

BARLOW, P. W. *Improvements in the permanent way of railways.* Dated Sept. 24, 1856. (No. 2237.)

This consists in supporting the rails of railways by wooden chairs placed at intervals on, and supported by, iron sleepers; or in connection with wooden sleepers.

BEATSON, W. *Improvements in puddling iron.* Dated Sept. 24, 1856. (No. 2239.)

This consists in puddling iron in a vessel rotating on a horizontal axis, and heated by a furnace communicating with the rotating vessel at one end, and with the chimney at the other. The iron is introduced through a door, and in place of moving the pieces about when in the furnace by hand, the vessel is caused to rotate, and in so doing exposes all the metal to the action of the flame. The agitation of the metal may be increased or entirely produced by causing streams of nitrogen or carbonic acid gas to pass through it.

PROST, V. F. A. *Improvements in weaving, and in the machinery or apparatus employed therein.* Dated Sept. 24, 1856. (No. 2241.)

This consists—1. In weaving in a perpendicular position ribbons, laces, and other fabrics formed transversely in the loom or frame; that is to say, instead of placing the warp threads horizontally, they are carried up perpendicularly, the harness or heddles working horizontally; and the threads are so arranged that the fabrics when woven have their selvages parallel, presenting their edges to the front and back of the loom or frame. Other improvements in details are included.

BROWN, R. *Improvements in taps or valves.* Dated Sept. 25, 1856. (No. 2242.)

These are improvements particularly designed for application to the float and lever tap by which water cisterns are supplied, and intended to render such taps less liable than hitherto to get out of order. A further improvement consists in making the float lever in two pieces, one formed with a socket, so that it can be adjusted upon the other by a pinching screw, for regulating the leverage of the float according to the pressure of the water.

HOLMES, T., and T. ASPINALL. *Improvements for preventing or diminishing the production of smoke in fire-places and furnaces, and for effecting its combustion.* Dated Sept. 25, 1856. (No. 2243.)

This consists in the application of lime, or of substances containing lime, either alone or with the addition of alkaline substance, to the fuel employed.

WILSON, J. W. *Improvements in machinery or apparatus for manufacturing parts of brooms and brushes.* Dated Sept. 25, 1856. (No. 2244.)

These relate—1. To a particular arrangement of the smoothing tool for the finishing cut in forming the long handles of brooms or other round parts, which are produced by forcing a piece of wood of an irregular figure through a hole in a rotating cutter head, having suitable instruments attached which reduce and complete the article, and whereby a smooth surface is produced. 2. To apparatus for forming the rounded ends of broom handles, and other spherically formed parts of such articles. 3. To an apparatus for chamfering or bevelling the edges of broom heads.

ALBRIGHT, A. *Improvements in the manufacture of lucifer matches, and of boxes suitable for containing the same.* Dated Sept. 25, 1856. (No. 2249.)

These consist in the use of flour paste to cause the materials of which the head of the match is composed to adhere to the splint of wood or raw match. Also, in omitting from the match-composition phosphorus and chlorate of potass, and in afterwards applying to the surface of the heads of matches a thin coating of amorphous phosphorus. Also, in coating the heads of lucifer matches with an aqueous shellac varnish, or with a mixture of white of egg or blood with lime or chalk, to which may be added powdered glass, oxide of iron, and other substances. Also, in coating boxes made of chip or scale-board doubled up to form the box, with varnish or composition to render them waterproof, or partially so.

FROST, R. *Improvements in the manufacture of flour.* Dated Sept. 25, 1856. (No. 2250.)

This consists in artificially heating the air forced between the grinding surfaces. It also consists in passing the products of the grain, when ground, over heated surfaces, or in exposing such products to currents of heated air.

RUSSELL, J. J., and J. B. HOWELL. *Im-*

provements in the manufacture of cast-steel tubes. Dated Sept. 25, 1856. (No. 2251.)

This consists in making tubes from sheets or strips of cast-steel, previously rolled or formed to the thickness and size desired.

MUIR, M. A., and W. J. WALKER. *Improvements in machinery or apparatus for sizeing or dressing yarns or threads.* Dated Sept. 25, 1856. (No. 2252.)

This consists of modifications of the "tape" sizeing-machine for dressing yarns or threads.

CALLEY, S. *Improved composition and compositions for coating or covering surfaces, particularly the bottoms of ships and vessels.* Dated Sept. 25, 1856. (No. 2553.)

Ferruginous substances are mixed with a paint vehicle or volatile spirit, and bituminous or tarry substances, which being mixed form a mass, and the sides of ships and vessels, and other surfaces, can be painted over, to protect them from weed, &c.

LANGLOIS, C. *Improvements in photography.* Dated Sept. 26, 1856. (No. 2254.)

This consists in arranging photographic cameras so that the operator can adjust the focus from the front, or that side next the object to be taken; and, also, so that the frame containing the material for receiving the image may be used for ascertaining the exact focus. Also in backing photographic pictures with plaster of Paris.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

CLARK, A. *Improvements in signal-lamps.* Dated Sept. 19, 1856. (No. 2201.)

This is particularly applicable to lamps used on board ship for signalling to the helmsman at night, and it consists in surrounding a single lamp with a rotating six-sided lantern, each of the sides of which is glazed with coloured glass, and the opposite sides with glass of the same colour.

DAWES, G. *Improvements in the manufacture of hats.* Dated Sept. 19, 1856. (No. 2204.)

A ring of horse-hair or other stiff elastic fabric is placed under the lining, and this ring is doubled over upon itself, and where doubled is sewn all round to the edge of the hat. The elasticity of it gives softness to the inside of the hat, the ventilation is improved, and the passage of grease to the outside is prevented.

VAN HEES, R. *Improvements in the construction of electric clocks or time-keepers.* (A communication.) Dated Sept. 19, 1856. (No. 2205.)

The dial is of glass, and the parts which connect the fingers with the working parts are also of glass, so as to allow of the clock being illuminated without casting any shadow upon the dial. The electrical arrangements are also described by the inventor.

SHERAR, J. *Improvements in oil and spirit lamps by the formation of burners obviating shadow.* Dated Sept. 20, 1856. (No. 2207.)

The outer part of the burner, between which and the part holding the wick the air passes to support the flame, is made of a conical shape, and at such a distance from the flame as to allow of the light passing beneath as well as above this outer part, without throwing any shadow below or round the lamp.

VAN HEES, R. *Improvements in the construction of wrought iron wheels for railway and other purposes.* (A communication.) Dated Sept. 20, 1856. (No. 2208.)

This applies to plate or disc wheels, and consists—1. In rolling the disc and the nave of the wheel in one piece. 2. In giving a dished or concave form to the disc so as to impart elasticity thereto. 3. In a method of rolling up a run or flange around the periphery of the disc for attaching the tyre thereto.

NAYLOR, J. *Improvements in window fastenings.* Dated Sept. 20, 1856. (No. 2209.)

This consists of certain self-acting window fastenings which require engravings to illustrate them.

JOHNSON, W. *Improvements in steam boilers.* (A communication.) Dated Sept. 20, 1856. (No. 2210.)

The top of the fire box of locomotive and similar boilers is to be made concave, or curved inwards towards the fire. In combination with this form of fire box top, a stay, with a curved under side, may be used.

COCHRANE, The Hon. W. E. *An apparatus for converting crude iron, while in a fluid state from a blast or other furnace, into malleable or bar iron and steel.* Dated Sept. 20, 1856. (No. 2211.)

This consists in an apparatus by means of which crude iron in a fluid state from a blast or other furnace is freed from the carbon it may contain, and rendered into malleable or bar iron and steel, by allowing it to flow down inclined, enclosed, or partially enclosed planes or descents exposed to a forced current of air or vapour capable of evolving oxygen, instead of forcing the air or vapour up through the quiescent metal.

MAUDSLAY, J. *Improvements in fireplaces for steam boilers.* Dated Sept. 20, 1856. (No. 2212.)

This consists in so constructing the fireplaces of steam boilers as to admit of the introduction of a blast of air for the combustion of the fuel directly into the fireplace, from the sides or otherwise, instead

of admitting currents of air through the fire bars as in common use.

SELLERS, W. B. and A. *An improvement in ever-pointed pencil cases.* Dated Sept. 22, 1856. (No. 2221.)

This consists in providing a reserve or magazine for leads at the mouth or neck of "ever-pointed pencil cases," and chiefly applies to such cases as carry a knife at one end.

WILSON, J. and C. WOOTTON. *A new or improved screw wrench.* (A communication.) Dated Sept. 22, 1856. (No. 2222.)

This consists of a screw wrench, in which the moveable chap or jaw slides on a bar, on one side of which a deep depression is formed. On the inner side of one of the ribs formed by the depression a rack is formed, and a pall or click attached to the moveable chap or jaw is pressed by a spring upon the rack so as to engage therein.

BOYD, D. O. *Improvements in constructing and arranging flues for the passage of air or smoke.* Dated Sept. 23, 1856. (No. 2226.)

This consists in constructing the partition between two smoke flues of bricks having passages through them, in such manner that when laid one on another in building the partition, the passages in the bricks form an air flue between the two smoke flues.

WINTERBOTTOM, R., jun. *Improvements in the mode or method of making or producing dry barm or yeast.* Dated Sept. 23, 1856. (No. 2228.)

The inventor takes brewery or distilling barm and purifies it with pure or clear lime water, or spring water, stirs it well together, and leaves it until settled. He then draws off the water, and adds ammonia, carbonate of soda, and more spring water, and lets it stand for twelve hours. He then draws off the water clear, puts it in a press, and subjects it to pressure until it is dry. He then puts it in a bag to be kept cool until used.

LESPINASSE, A. J. B. *Improvements in the means of obtaining motive power.* Dated Sept. 24, 1856. (No. 2234.)

This relates to a hydraulic apparatus. A reservoir of water fitted with a syphon, the longer limb of which passes down to a water wheel, directs a stream of water on to either side of the wheel, according to the direction of rotation required. The axis of this wheel works a set of pumps for raising the water which has acted upon the wheel, and returns it again to the reservoir.

HOWELL, J. B., and N. HARVEY. *Improvements in steam and other boilers.* Dated Sept. 24, 1856. (No. 2238.)

Plates of cast steel are riveted together with steel rivets, and an angle or T-steel is used for supporting the shell of cast steel plates.

VION, C. *Improvements in metallic moulds, and in the manner of using them for casting metals.* (A communication.) Dated Sept. 24, 1856. (No. 2240.)

This consists—1. In a novel arrangement of metallic moulds, coated with an intervening substance, to prevent the cast metal from adhering to the mould; and 2. In the manner of using these moulds.

SAYNO, C. *Improvements in bearings, beds, or sockets for axles, pivots, or other rotary parts of machinery.* Dated Sept. 25, 1856. (No. 2245.)

This consists in having balls, cylinders, or truncated cones interposed between the rotary parts and the surface of the bearings, and thus changing the sliding into rolling friction.

SILOY, H. J. M. E., and A. A. H. PLAGNIOL. *Improvements in harness.* Dated Sept. 25, 1856. (No. 2246.)

For a two horse carriage with pole, a forked metal piece is fixed to the saddle, and another flat metal piece to the fore end of the traces, which latter piece fits into the fork where it is kept by a bolt. The driver from his seat may, by a strap or cord fixed to this bolt, draw it out, and thereby unclose the trace, and as the front end of the pole is provided with a moveable cap fixed thereto by a spring, the horses on advancing act on this spring, and unloose the cap from the pole, and liberate themselves from the carriage.

SABATIER, E. *Improvements in the permanent way of railways.* Dated Sept. 25, 1856. (No. 2247.)

This consists in having before and behind the switches, on both sides of the track, two rocker arms, acting on the switches by levers, so that whenever the locomotive, in passing over the line, lowers the rocker arms of the side towards which the train is directed, the moveable part of the switches is carried towards the opposite side of the track, and at the same time raises the rocker arms of this opposite side, so that another locomotive, going forwards from this opposite side, will find the rocker arms ready to act in the opposite direction.

PARNELL, H. W. *The construction of ships and boats.* Dated Sept. 25, 1856. (No. 2248.)

The vessel is to be built on two keels, which will be placed at some distance from each other, and the ship's bottom between the keels arched, forming a tunnel extending the whole length of the vessel. The crown of the arch will be pierced for paddle-wheels.

MEAKIN, J. F. *An improved fire-escape.* Dated Sept. 26, 1856. (No. 2255.)

See *Mechanics' Magazine*, No. 1735, vol. lxv., p. 439.

RANSOME, F. *Improvements in the manu-*

facture of artificial fuel. Dated Sept. 26, 1856. (No. 2260.)

This consists in preparing artificial fuel from small coal, by placing the same in moulds, which are then heated so as to cause the coal to agglomerate.

PROVISIONAL PROTECTIONS.

Dated February 12, 1857.

412. Thomas Turner, of Grosvenor-street, Commercial-road East, and Henry Boyens, of George-street, Commercial-road East. Improvements in apparatus for steering ships and vessels, and in apparatus for communicating or signalling between the deck and engine-room of steam-vessels.

Dated March 17, 1857.

744. Charles Askew and John Askew, of Charles-street, Hampstead-road, coppersmiths, and Henry Myers, of Upper Charlotte-street, surgeon. Improvements in hydraulic and refrigerating apparatus for the purpose of raising sunken vessels, anchors, and all other submerged bodies, with light and other certain apparatus used for the same purposes.

Dated March 20, 1857.

780. Edward Gripper, of Winchester Wharf, Southwark, corn-factor. The treatment of the fruit or vegetable "algorabas," and in the application of the same as food for cattle.

Dated March 25, 1857.

830. George Douglass Early, of Camberwell, Surrey, artist, and John William Edmonds, of the same place, gentleman. A method of producing glass designs, figures, and patterns.

Dated April 6, 1857.

966. Charles Goodyear, of Leicester-square, gentleman. Improvements in the manufacture of waterproof boots and shoes, applicable also in part to boots and shoes of other kinds, and to other outer coverings for the feet.

Dated April 15, 1857.

1062. Robert Knowles, of Manchester, manager. Certain improvements in power-looms for weaving.

1064. Louis Barnett, of New-street, Bishopsgate, London. Improvements in the making and cutting-out of garments.

1066. Charles Goodyear, jun., of Leicester-square. An improved manufacture of paper-knife.

1068. James Payne, of Kirkcudbright, N. B., ironmonger. Improvements in scythes.

1070. Jacob Safran, of Wellclose-square, cabinet-maker. Improvements in locking or fastening combinations of drawers in chests, tables, nests, or otherwise.

Dated April 16, 1857.

1072. John Sudbury and Alfred William Linsell, of Halstead, Essex, brass-founders. An improved gas-regulator.

1074. Thomas and Frederick Sugden, of Oldham, Lancaster, machinists and tool-makers. Improvements in sewing-machines.

1076. William Weild, of Manchester, machinist. Improved arrangements for printing, dyeing, colouring, or staining and otherwise preparing yarns or threads for various manufacturing purposes.

1080. James Warburton, of Addingham, York, manufacturer. Improvements in preparing and combing wool and other fibres.

1082. James Warburton, of Addingham, York, manufacturer. Improvements in carding machinery.

1084. James Warburton, of Addingham, York, manufacturer. Improvements in preparing and combing wool and other fibres.

Dated April 17, 1857.

1088. Edward Oldfield, of the Adelphi Iron-works, Salford, Lancaster, machine-makers. Improvements in self-acting mules for spinning and doubling. Partly a communication.

1090. Jean Marie Leonidas Caillaud, of Stratford, Essex. Improvements in removing the fur from the skins of rabbits, and in preparing rabbit, calf, and other skins for tanning.

Dated April 18, 1857.

1092. John Smith, of Kidderminster, mechanic. Improvements in the manufacture of carpets.

1094. Thomas Harris, of Shiffnall, Shropshire, veterinary surgeon. Certain improvements in the mode of constructing and applying horseshoes.

1096. David Hunter Brandon, of Rue des Moulins, Paris, civil engineer. Improvements in fastenings for shutters, windows, doors, &c. A communication.

1100. Gustav Jahn, of Bedford-row, Middlesex. Improvements in revolver fire-arms.

1102. Charles Richard Barnes, of New York, United States. Improvements in means for hulling and cleaning rice, and other grains having a hull or husk.

Dated April 20, 1857.

1106. Richard Ford Sturges, of Birmingham, manufacturer. A new or improved manufacture of metallic pens.

1110. Robert Tindall, jun., of Fraserburgh, Aberdeen, engineer. Improvements in harpoon guns and ammunition.

1112. John Underwood, of Gloucester-road, Middlesex, gentleman. An improved method of printing, and of preparing materials employed therein.

1114. William Edward Newton, of Chancery-lane, civil engineer. Certain improvements in meters for measuring the flow of gas, water, or other fluids. A communication.

Dated April 21, 1857.

1116. Henry Wimball, of Aldermaston, Berks, brick-manufacturer. Improvements in pug-mills.

1118. William Crighton, of Manchester, machinist, and Peter Foxcroft, of Pendleton, manager. Improvements in machinery or apparatus for preparing cotton, wool, or other fibrous substances to be spun.

1120. William Gossage, of Widnes, Lancaster, chemist. Improvements in the manufacture of certain kinds of soap.

1122. Edwin Marten, of Mitcham, Surrey. Improvements in apparatus for regulating the pressure and supply of gas.

1124. Henry Smart, of Queen's-terrace, Bayswater. Improvements in organs.

Dated April 22, 1857.

1128. Thomas Burton, of Padiham, Lancaster, and Simeon Lord, of Burnley, said county. An improved self-acting steam-pipe regulator, which is also applicable to drying-cylinders, and other similar purposes.

1129. James Higgin and John Lightfoot, of Manchester, manufacturing chemists. An improved compound and improvements in the method of applying the same for the purpose of stiffening fibrous or textile materials, the same being applicable to the fixing of colouring matters or pigments.

1130. William Williams, of Liverpool, master-mariner. An improved propeller for propelling ships, boats, and other vessels.

1132. William Kendall, of Blawith, Ulverstone, Lancaster, wood-turner. Improvements in the manufacture of boxes and similar articles, and in

the machinery or apparatus to be employed therein.

1134. Robert Taylor, Richard Worswick, and John Lovatt, all of Ipswich, engineers. Improvements in railway chairs, and in the mode of securing the ends of rails therein.

1136. Richard Boxall Grantham, of Great Scotland-yard, London, civil engineer, and John Grantham and Henry Sharp, of Liverpool, engineers. Improvements in graving docks.

1138. William Robertson, of Manchester, mechanician. Certain improvements in machines for preparing to be spun cotton and other fibrous materials.

Dated April 23, 1857.

1144. James Morison, of Paisley, N. B., machinist. Improvements in portable shower and sponge baths.

1146. George Scarr, of Burnley, Lancaster, iron-founder, and James Pollard, of the same place, mechanic. Certain improvements in power-looms for weaving.

1148. John Garnett, of Wells-street, Oxford-street. Improvements in the construction of corsets.

1150. Rudolph Bodmer, of Thavies-inn, Holborn. Improvements in safety-valves for steam boilers. A communication.

1152. Albert Demerit Bishop, of Woolwich, engineer. An improvement in the construction of windlasses.

1154. Alexander la Paraz, of Gloucester-place, Portman-square, and Josephine Mazel, of King-street, Portman-square. Improvements in preparing paints and varnishes. A communication from Messrs. Carpentras and Mazel, of Paris.

Dated April 24, 1857.

1158. Robert Fowler Swift and Richard Swift, of Wenlock-road, City-road, engineers, and John Cormes, of Balmes-road, Hackney, engineer. Improved machinery for washing, wringing, and mangling clothes or fabrics.

1160. William Clark, of Chancery-lane, engineer. Improvements in machinery or apparatus for embroidering. A communication.

1162. Thomas Craddock, of Tachbrook-street, Pimlico, engineer. Certain improvements in the steam engine and the steam boiler.

Dated April 27, 1857.

1180. Charles Cowper, of Southampton-buildings, Chancery-lane. Improvements in electro-plating and depositing metals. A communication from H. Landois and L. Daniel, of Paris.

1182. William Thompson and Hamilton Woods, of Newcastle-on-Tyne, engineers. Improvements in lowering weights by means of cranes, winches, or similar apparatus.

1184. Peter Armand Lecomte de Fontainemoreau, of South-street, Finsbury. Improvements in obtaining motive power. A communication.

1186. Alfred Eddington, of Springfield, near Chelmsford, Essex. Improvements in machinery for ploughing, tilling, and draining land.

1188. William Levesley, of Sheffield, ivory-carver. Improvements in manufacturing the blanks of forks, scissors, cutlery, chisels, and other tools, which improvements are applicable to the manufacture of springs for pocket-knives and other like articles now prepared by the forging process.

Dated April 29, 1857.

1203. John Aitken, of Essex-street, Islington, gentleman. An improvement in furnaces for melting the materials of glass, iron, and other metals, and for boiling water and other substances.

1205. William Joseph Curtis, of Crown-court, Old Broad-street, London, civil engineer. Improvements in apparatus to facilitate passengers ascending to and descending from the roofs of omnibuses.

1207. François Menusier, of Rue de l'Echiquier, Paris. An improved bee-hive.

1209. George Bartholomew, of Linlithgow, N.B., edge-tool maker. Improvements in tanners' and curriers' knives.

Dated April 30, 1857.

1215. Barnard Barcroft, of Radcliffe-hall, near Manchester, manufacturing chemist. Improvements in dyeing and printing.

1217. John McDowall, of Walkinshaw Foundry, Johnstone, N. B., engineer. Improvements in steam hammers.

1219. William Edward Newton, of Chancery-lane, civil engineer. Improved machinery for moulding and pressing bricks. A communication.

1221. George Powers, of Wellclose-square, Middlesex, smith. An improved scuttle for ships.

1223. Samuel Robert Lewis, of Catherine-street, London, E. Improvements in trowsers.

1225. John Collins, of Birmingham, civil engineer. Improvements in furnaces and flues, and in kilns and drying-chambers.

Dated May 1, 1857.

1227. John Avery, of Essex-street, Strand. An improved washing or fulling-machine. A communication from J. L. Boucher.

1229. Edward Hawkes, of Birmingham, tobacconist. New or improved machinery for the manufacture of pipes for smoking.

1231. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in apparatus for preventing collisions at sea. A communication from Messrs. Trève and Pitel, of Brest.

1233. Richard Leake and Matthew Sykes, of Barnsley, York. Improvements in consuming smoke and generating heat in furnaces of steam engine or other boilers, also heating the feed-water of the said boilers, therefore economizing fuel to a great extent.

Dated May 2, 1857.

1235. Edward Tucker, of Belfast, starch-manufacturer. Improvements in the manufacture of starch.

1239. Charles Châtel, of Paris, draughtsman. Improvements in the manufacture of blinds, screens, reflectors, and other articles of a similar nature.

1241. Joseph Davy, machine-maker, and William Bentley, overlooker, both of Bradford, York. Certain improvements in looms for weaving fibrous substances.

1243. Adolphe Louis Cauville, of Paris. Improvements in the manufacture of shoes and boots.

1245. John Marland, of Lawrence, Massachusetts, United States, manufacturer. Improvements in cop tubes used in spinning.

1247. John Peter Booth, of Cork, feather purifier. An improved manufacture of stuffing for beds, couches, cushions, and other seats.

1249. Tertius John Cooke, of Wolverhampton, gentleman. Improvements in the manufacture of knobs, roses, and escutcheons used for doors, drawers, shutters, and other similar purposes.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," May 19th, 1857.)

63. G. P. Cooper. Improvements in the manufacture of shirt-collars.

76. J. R. Day and J. L. Hinks. Improvements

in constructing and attaching knobs and handles of drawers and doors, cupboard turns, and other like articles.

79. J. H. Johnson. Improvements in the application of the electrotype or galvano-plastic processes. A communication.

82. J. Gibbs. Improvements in extracting gold and silver from their matrices, and from other substances or materials with which they are combined, mixed, or associated.

83. J. Bagshaw and J. P. Harris. Improved medicinal mixtures adapted for curing diseases of cattle.

85. L. J. Brethon. Improvements in machinery for manufacturing draining pipes, bricks, tiles, and all other similar plastic articles.

86. D. D. Kyle. A method of retarding or stopping railway trains and carriages, applicable also to carriages on common roads.

94. W. Watt. Improvements in treating or preparing Indian corn and other grain and amylaceous vegetable substances for fermentation and distillation.

109. M. Potter. The application of certain materials in the manufacture of healds for weaving.

116. J. C. Haddan. Improvements in smelting ores, and in roasting and extracting products therefrom. A communication.

120. A. C. Hobbs. An improvement in locks and latches.

122. G. Parker and W. Martin. Certain improvements in machinery for opening, cleaning, and preparing cotton.

126. F. Watkins. Improvements in machinery for manufacturing bolts, spikes, and rivets.

128. J. Homan. Improved machinery for folding cloth into lengths.

131. R. Adamson and R. Holland. Certain improvements in looms for weaving.

144. P. Walker. Improvements in apparatus employed in distilling and in the manufacture of vinegar.

150. J. Long. Improvements in the fastenings of brooches and other articles of jewellery.

154. J. Haswell. Improvements in the construction of railway carriages, which improvements are also applicable to locomotive steam engines.

162. W. E. Newton. Certain improvements in sewing-machines. A communication.

166. V. A. Kientsy. Improvements in machinery to be worked by steam or other power for clearing and ploughing land.

172. J. H. Johnson. Improvements in apparatus for the preservation of money, books, papers, and other property, in case of disaster to ships and other vessels. A communication.

174. J. Massey and J. Hargreaves, jun. Certain improvements in machinery or apparatus employed in the preparation of cotton and other fibrous materials for spinning.

185. H. Cater. Improvements in steam boilers.

250. R. A. Brooman. An improved protective matting or fabric for sheltering plants, shrubs, and other vegetable productions, pits, frames, and other similar structures, together with machinery for manufacturing the same, and the mode of supporting it when in use. A communication.

272. S. Montagu. Improvements in packing-cases.

345. A. Dècle and F. A. Drault. Improvements in the manufacture of bracelets.

442. A. Smith. Improvements in machinery for the manufacture of wire rope and other ropes.

524. J. Brown. A method or methods of preparing paper to enable it to receive an impression from an engraved block or plate, type, or other printing agent, while in a dry state.

641. W. Muir. Improvements in generating steam for marine purposes.

744. C. Askew, J. Askew, and H. Myers. Improvements in hydraulic and refrigerating apparatus for the purpose of raising sunken vessels, anchors, and all other submerged bodies, with light and other certain apparatus used for the same purposes.

753. W. MacNaught. Certain improvements in engines worked by steam or other motive power, and in their gearing for connecting them with machinery, and in the means of lubricating such engines.

795. G. Perrott. Improvements in horse gearing.

806. E. Hyde. Improvements in the manufacture of fabrics from products of the husks of cocoa-nuts.

930. A. Paget. Improvements in machinery or apparatus for the manufacture of looped fabrics, and in the manner of constructing the same.

947. E. Testelin. A new system for the application of electricity as moving power.

954. W. Perks, jun. A new or improved manufacture of crown and sheet glass.

960. C. Burrell. Improvements in portable steam engines suitable for agricultural purposes.

1032. H. Adcock. Improvements in steam boilers.

1068. J. Payne. Improvements in scythes.

1105. T. Sanderson. Improvements in wheeled carriages.

1107. J. C. Martin. An improvement in the manufacture of paper.

1110. R. Tindall, jun. Improvements in harpoon guns and ammunition.

1130. W. Williams. An improved propeller for propelling ships, boats, and other vessels.

1148. J. Garnett. Improvements in the construction of corsets.

1150. R. Bodmer. Improvements in safety-valves for steam boilers. A communication.

1171. J. Simpson and E. Rimmer. A certain improvement in Venetian blinds.

1175. The Rev. J. Burrow. Improvements in coating wrought iron.

1184. P. A. L. de Fontainemoreau. Improvements in obtaining motive power. A communication.

1219. W. E. Newton. Improved machinery for moulding and pressing bricks. A communication.

1245. J. Marland. Improvements in cop tubes used in spinning.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1058. Christopher Nugent Nixon.
1065. Moses Poole.
1099. Christopher Catlow and Thomas Comstive.
1109. James Coley March.
1111. John Maclean, jun., and Thomas Finlayson.
1147. Louis Emile Dufour.
1196. Henry Doulton.
1217. James Timmins Chance.
1403. Emile Hubner.

LIST OF SEALED PATENTS.

Sealed May 15, 1857.

2704. Andrew Barclay.
2711. Christopher Binks.

2720. William Healy.
2724. Samuel Dyer.
2735. Thomas Hindle.
2745. Peter Armand Lecomte de Fontainemoreau.
2795. John Palmer.
2823. John George Taylor.
2843. Francis Peabody.
2855. John Fowler, jun.
2857. Robert Dryden and Stephen Miles.
2947. William Colborne Cambridge.
3041. William Edward Newton.
167. Thomas Johnson.
233. John Henry Johnson.
539. Joseph Betteley.
649. George Bower.
773. William Reid.
633. Alfred Vincent Newton.

Sealed May 19, 1857.

2736. George Watson and Cornelius Satterthwaite.
2739. Samuel Fox.
2741. Samuel Fox.
2757. John William Clare.
2762. William Jacobs.
2763. Joseph Barrans.
2765. Richard Archibald Brooman.
2768. Alexander Clark.
2771. Alexander Robert Terry.
2774. Joseph Wheeler.
2775. Richard Archibald Brooman.
2776. John Skirrow Wright.
2787. Henry Brickley.
2852. Richard Archibald Brooman.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

Erratum.—Last Number, p. 470, col. 1, line 10 from top, *for* "dock" *read* "dark."

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris: Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

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Edited by R. A. Brooman, 166, Fleet-street.

WHITTLE'S IMPROVED MACHINES FOR MAKING NAILS.

Fig. 6.

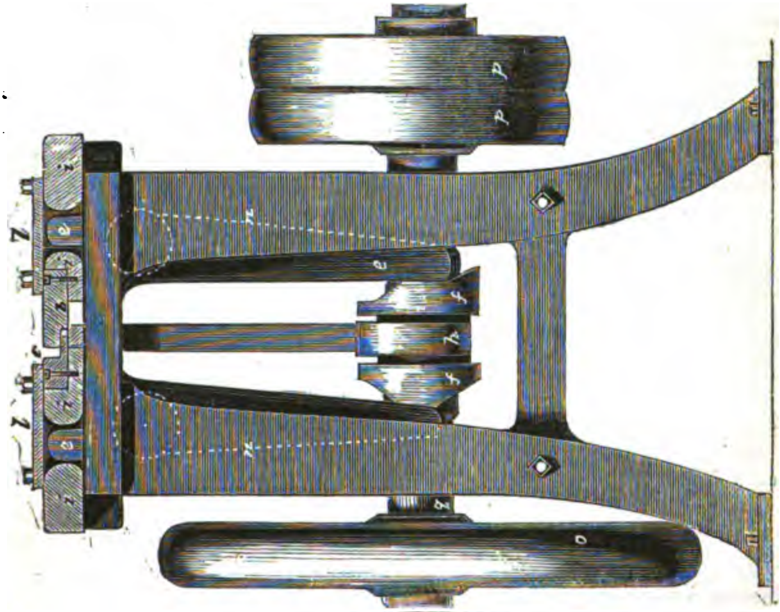
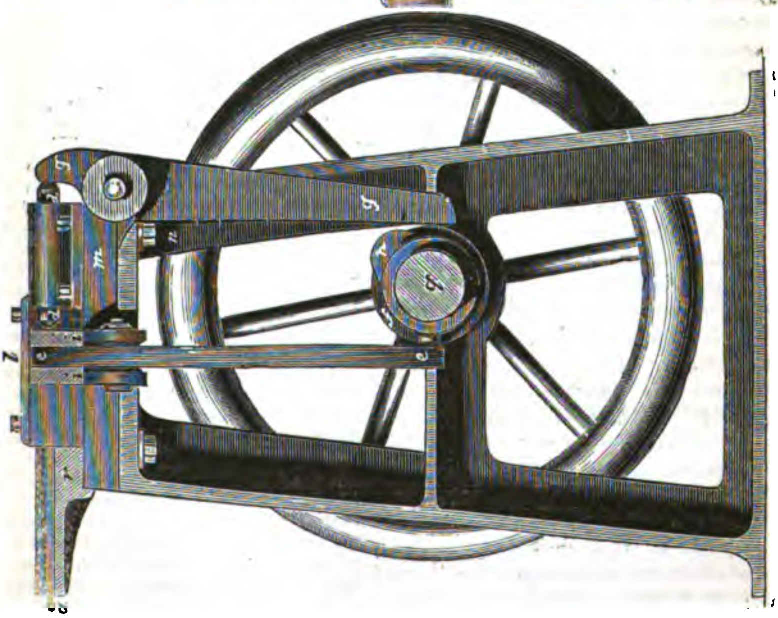


Fig. 5.



WHITTLE'S IMPROVED MACHINES FOR MAKING NAILS.

(*Concluded from page* 386.)

Fig. 5 represents in side elevation, with a part of the framing removed, a machine for heading nails and similar articles; fig. 6 represents the same in front elevation, partly in section: *a* is the metal from which the nail or other similar article is formed; *b* and *c* are dies for gripping the blanks while being headed; *d* is the heading bolt or slide; *e*, *e*, are levers for working the slides, *i*, *i*, which said slides, *i*, *i*, carry the dies, *b* and *c*; *f*, *f*, are side cams for giving motion to the levers, *e*, *e*; *g* is the lever for working the heading tool, *d*; *h* is a cam for giving motion to the said lever, *g*; a fixed cutter (not shown) is used for separating the nail from the blanks; *k* is an opening in the bed of the machine through which the nails are delivered after being headed; *l*, *l*, are caps for holding down the slides, *i*, *i*; *m* is the bed of the machine; *n*, the standards; *o*, the fly-wheel; *p*, *p*, the fast and loose pulleys for giving motion to and stopping the machine; *q* the main shaft; *r* is a table attached to the bed of the machine for supporting the nail rods.

The action of the machine is as follows:—The gripping dies, *b*, *c*, being sufficiently apart to admit of the series of blanks previously prepared to pass between them, the blank is advanced until it stops against the heading tool, *d*, when a sufficient quantity of metal to form a head is thus left between the gripping dies and the heading tool, *d*. The gripping dies, *b*, *c*, now advance by the action of the cambs, *f*, *f*, and levers, *e*, *e*, and securely hold the blank. The heading tool is now made to advance by the action of the cam, *h*, and lever, *g*. The head having been formed, the heading tool recedes, and the gripping dies, carrying the finished nail, both advance in the direction of the opening, *k*, and cut off the nail from the blank against the fixed cutter, when the action of the cams, *f*, *f*, cause the slides to recede from each other and allow the nail to drop from the machine. The slides are now brought into their former position, and the rod again advanced by the workman, and the operation described repeated.

The same arrangement of machinery may be employed for forming rivets, spikes, and screw blanks.

THE AMERICAN STEAM CORVETTE "NIAGARA."

The visit of the American steam corvette *Niagara* to this country has excited considerable public attention, which has been increased by the fact of its occurring almost simultaneously with a spirited debate in the House of Commons, in which the merits of steam ships of war were contrasted with those of sailing ships, and the uses of large ships with those of small. A few considerations, suggested by a visit to this leviathan vessel, will not, therefore, be inappropriate, particularly as non-professional persons are liable to be misled by indiscriminate statements respecting the proportions of a new ship, the sizes of her guns, and the weight of the shot or shell which they are designed to throw. To prevent misapprehension upon these points, and to aid the public in estimating the merits of such a ship as the *Niagara*, we shall make reference to some of the new class ships of our own service, and compare her with them. The comparison will, we think, show that our own naval administrators have but little to learn from our American brethren, either in foreseeing future requirements, or in adapting the structure and armament of their ships to such requirements.

The *Niagara* is a vessel 345 feet long over all, 55 feet in extreme breadth, and, when equipped for sea, will draw 26 feet of water. Her burden is upwards of 5,000 tons. Her armament is to comprise 12 11-inch guns on Dahlgren's principle, and these are to fire shells. She is propelled by engines having three cylinders 6 feet in diameter and of 3 feet stroke, each engine being complete in itself, and capable of working without the others. Her propeller is 18 feet 8 inches in diameter, and is provided with means for varying the pitch, being at present set to a maximum pitch of 32 feet. She is said to have attained a speed of 13 knots per hour under full steam power; but if we set it down at 12 knots, we shall probably do her more than justice; for when she was tried at New York she attained no more than 11 knots.

Before proceeding further, we may state that the *Niagara* is, without exception, the ugliest ship of war we have ever seen. On visiting her at Gravesend we approached her on the bow, and looked in vain for a single beauty of form about her. Her bow appeared to be one great plane, and her side another, the two being very differently inclined, of course, and breaking into each

other with a harsh, sudden curve, on which the light struck so sharply that it produced a positively painful impression. Besides this, the shade lies so deeply along her long flat side, that she seems actually to narrow in midships, where she should, of course, be broadest. Further, she has no knee of the head whatever, but an almost upright stem, and consequently lacks altogether that appearance of haste and eagerness which characterizes a vessel with a long and graceful knee. Her sheer is enormous, and impresses one against his will with the feeling that her constructor expected her to break or "hog" greatly, and made allowance for the change. Nor does she convey any sense of excessive magnitude when viewed externally, although, when you have boarded her, and look away from one end of her spar-deck to the other, it is difficult to realize the fact that you have but a 12-gun corvette before you. We do not over-rate these defects of form, but having so often admired, and justly admired, the real beauty of many of our men-of-war, we could not refrain from mentioning them.

We pass on, however, to other considerations; for a war ship may be very efficient and very terrible, notwithstanding any extent of ugliness. But before we discuss her armament, we will quote from an article on the *Niagara*, in the *Journal of the Franklin Institute* (American), contributed by a very well-informed writer, the following remarks, which, so far as we observed, appear to be accurate:—"Her coal bunker capacity will," he says, "only be about sufficient for twelve days' full steaming, if so much. Her capacity for stores is so much below what it should be, that her water-tanks are constructed to fit down to the bilges, filling the space between the keelsons (which it is essential should be left open and arranged for easy cleaning in warm climates). When the ship was commenced, 100 feet was given up to engines, boilers, and coal-bunks; but since her internal capacity has been found so small, 7 feet of this space has been taken off, which has reduced the coal capacity to a very low point for her power. On the berth deck the officers' quarters are very roomy, and occupy a large portion of it; while the forward part, devoted to the crew, will (considering the number that occupy it) be found very small. ...... I am certain that the constructor of the *Niagara* finds many things overlooked, and hence the difficulty of finding room for all she has to carry." These are important considerations, and will have the greatest weight in influencing the judgments which intelligent men will pronounce upon the ship.

We now come to the armament of this unique engine of war. All the size, all the engine power, and all the sailing power of this *Niagara* will have but the one object of sustaining, and carrying about at a high speed twelve great shell-guns. This is the purpose for which she is made of 5,000 tons displacement, and of enormous length, breadth, depth, and steam power, and has (or is to have) a crew of 750 men. The question arises,—is the end worthy of the means?

Now, in our own navy we have two new classes of steam ships—frigates, which carry guns on both the spar and the main decks. The first of these comprises the *Emerald*, the *Liffey*, the *Shannon*, &c., each of about 3,700 tons displacement—two-thirds of that of the *Niagara*; and each manned with 560 men—nearly 200 less than the *Niagara* carries. These vessels have on the main deck 30 8-ins. guns; and on the upper deck 20 32-pounders, and 1 68-pounder. The mean speed of the *Shannon*, ascertained by trial, in Stokes' Bay, on the 5th of June, 1856, was nearly 12 knots (accurately 11·8 knots) per hour. They draw, when fully equipped for sea, 21 feet of water forward and 22 feet aft—4 feet less than the *Niagara*. The cost of constructing one of these ships would fall short of that of the *Niagara*, if built in England, by many thousands of pounds, and the cost of maintenance in the two cases would, exclusive of the cost of fuel, be roughly in proportion to the number of men; that is as 550 to 750, or as 11 to 15.

The second class of these new frigates comprises the *Diadem*, *Doris*, &c., each of about 3,500 tons displacement—also about two-thirds of that of the *Niagara*; and each manned with 475 men—nearly 300 less than the *Niagara* carries. These vessels have on the main deck 20 10-ins. shell-guns; and on the upper deck 10 32-pounders, and 2 68-pounders. The speed of these ships will be much greater than that of the *Shannon*, as, though of smaller dimensions than she, their engines are of considerably greater power, the nominal horse-power in the one case being 600, and in the other 800. The *Diadem* and *Doris*, when fully equipped for sea, will draw 19 feet of water forward and 20 feet aft—6 feet less than the *Niagara*. The cost of constructing one of these frigates is still less considerably than that of the class first described, and the cost of maintenance is also reduced in proportion to the number of men, as before.

Although a frigate of the *Emerald* class could have many advantages over one of the *Diadem* class, yet, as the latter has a speed unquestionably equal to that of the *Niagara*, we will confine our attention to the smaller frigate. Let us then imagine that the

Diadem with her 32 guns meets in battle the far more bulky and costly *Niagara* with her 12 guns, and let them fight first in close action, and secondly at long range. First, then, while near her foe, the *Diadem* opens fire with 10 10-inch shell guns, 5 32-pounders, and 2 68-pounders, the latter being pivot guns, and capable of being fired both on the same side of the ship. The *Niagara* returns the fire with 7 11-inch shell guns. Now, supposing the broadsides of each are discharged with equal rapidity, we shall have the *Diadem* delivering 10 10-inch shells for every 7 of the *Niagara's* 11-inch, and surely the combatants would not be unfairly matched if these shell-guns alone were fought. But in addition to these the *Diadem* is pouring into her antagonist 5 32-pounder, and 2 68-pounder solid shots, and not a single shot has the *Niagara* to give in return for these. At the same time the *Niagara* presents to her foe a surface for attack nearly three times as great as her foe presents to her. And further, as a matter of fact, the guns of the larger ship could not be worked with anything like the rapidity of the frigate's guns; for every one of the 11-inch shells weighs more than even two men can conveniently continue to raise for any length of time, and requires to be got into the gun by cumbrous means, while the gun itself is of such large proportions as to occasion great labour in working it. Moreover, every shell must be got up as it is required from the shell-room below, while the solid shot of the frigate lie in abundance ready to hand round every hatchway, and close to the guns from which they are fired. In addition to all this, the whole of the guns of the *Niagara* are at a considerable height, 15 feet from the water; and, consequently, if there is a little sea on, are rolled about through large angles, while those of the frigate, being near the water, are comparatively steady, and therefore aimed with a precision and destructive effect which are quite unattainable in the larger ship. We cannot therefore doubt that in close fighting the *Diadem* would speedily capture her great, ungainly, and costly enemy.

It would be absurd to say that the *Niagara* is not designed to engage in close action, and would invariably avoid doing so. We may quote Sir Howard Douglas with advantage upon this point: "It will not," he says, "be always in the power of the commander of a ship, however desirous he may be of avoiding close action, to be able to accomplish that purpose; for in thick weather, or in a dark night, vessels may unexpectedly fall in with, and be very near before they discern each other. These contingencies may happen, and a close action may thus be suddenly brought on." ("Naval Gunnery," 4th edition, p. 257.) In addition to these eventualities, there is the very probable one of the ship falling short of fuel, and being unable to avail herself of her steaming powers.

Next let the same ships engage at long range. The speeds of the two ships being supposed still equal, we have only the relative merits of the armaments to consider in this case also. Now, it is well known that shells are fired over great distances with far less accuracy than solid shot, and also that their range is much less. Shells are much more affected than the solid shot by the action of the wind; and are also very liable to irregular rotations, because of the want of coincidence between their centres of form and centres of gravity, which results from irregularities in the thickness of the metal of the shell, from the removal of a portion of the metal to form the fuze-hole, and from the weight of, and resistance upon, the fuze itself. By experiments made on board the *Excellent* gunnery ship, it was proved that the number of shells which struck the objects fired at, was only two-thirds of the number of solid shot which hit when fired under precisely similar circumstances. It was also ascertained that at a distance of 3,000 yards, the differences between the ranges of hollow shot (or shells) were between 300 and 400 yards, while the differences between the ranges of the solid shots did not exceed 200 yards. Now we have as yet discovered nothing which induces us to think that the shell guns of the *Niagara* are to be unattended by the ordinary drawbacks of shell guns. Indeed, the excess of their magnitude above that of our own 10-inch shell guns would manifestly tend to increase their comparative disadvantages.

Sir Howard Douglas, than whom we know of no higher authority in these matters, distinctly tells us that, "A 10-inch gun for firing hollow shot (or shell) is inferior in range to a 68-pounder gun with solid shot. The difference of weight between these two pieces of ordnance is only 9 cwt., but the superiority of the latter in power of range, accuracy, and penetrating force, is of vast moment in steam warfare. . . . . Comparing a 10-inch shell gun of 84 cwt., charge 12 lbs., and a hollow shot of 84 lbs., with a 68-pounder gun of 95 cwt., charge 16 lbs., and solid shot, in respect of their range, we see that at an elevation of 1 deg. the difference of range is 142 yards, at 2 degs. it is about 190 yards, in both cases in favour of the latter; at 3 degs. the 68-pounder ranges about as far as the 10-inch gun does at 4 degs.; the range of the former at 4 degs. is greater than that of the other at 5 degs.; and at

higher elevations the differences in favour of the 68-pounder increase considerably. At 15 degs. the range of the 10-inch gun is 3,050 yards, and that of the 68-pounder gun 3,673 yards . . . . It should be added that hollow shot (or shell) being greater than solid of equal weight, are more liable than the latter to suffer lateral deflection from the action of the wind and other causes."

With these facts before us it is easy to predict that the *Diadem*, with her long-range, accurate, and effective 68-pounders in addition to her 10-inch shell guns, would deliver a far more effective fire into her huge antagonist, than the latter could hope to return.

Thus we have seen that under both conditions—of close action and long range—our cheap and small ship is superior to the American experimental monster. It is also well worthy of remark, that the comparatively light draught of water of the *Diadem* would enable her to be used in many operations to which the *Niagara* would be altogether inapplicable.

Having thus set forth the respective merits of the war ships which the surveyor of our own navy has prepared, and of that which the American Government have produced, it only remains for us to state that the *Niagara* has been found incapable of fulfilling the object for which she came to this country. This is a circumstance, however, which in no way affects her absolute qualities. The accommodation required is of an extraordinary extent, and such as it is not easy to obtain. It is required to stow no less than 1,300 miles (weighing 1,200 tons) of electric cable, in one piece, in each of two ships. In the *Agamemnon*, a 90-gun steam ship of our own navy, we have found a vessel which has a disposable space in the hold of no less than 45 feet in length, 47 in mean breadth, and about 12 deep; and if this will not take quite the whole of it, she has an extremely roomy orlop deck, upon which a portion may be placed in sufficiently large coils. The *Niagara* does not, and we never expected she did, contain clear spaces of anything like the same extent. Our Government will, therefore, endeavour to supply a second ship adapted to the purpose, and the will of our American friends will be taken for the deed. The *Niagara* will, however, accompany the telegraphic expedition, and will soon, we trust, see the cable landed successfully upon the side of the ocean whence she came.

SYMINGTON'S ORIGINAL MARINE STEAM ENGINE.

In the Inventors' Museum at Kensington is a restored steam engine, which is an object of the greatest interest to every intelligent visitor. It is the very engine which Symington first attempted to apply to the propulsion of vessels in water, as described at length in Mr. Woodcroft's excellent work on "The Origin and Progress of Steam Navigation." To the indefatigable researches of the author of this work the public is indebted for the recovery and preservation of this inestimable relic, with which the application of steam power to the propulsion of vessels may be said to have originated.

This little machine has the following claims to be considered the PARENT ENGINE of *steam navigation*.

Prior to the year 1788, when this engine was applied to propel a boat, numerous projects had been proposed, and a few abortive attempts had been made, to propel vessels by steam power, commencing with an experiment made as early as the year 1543; but the whole of the projects and experiments made previous to the application of this engine proved valueless for any practical use.

The result of the experiment with this engine, patented on the 5th June, 1787 (No. 1610), and made and worked by William Symington in 1788, and a larger one subsequently made on the same plan, demonstrated to him that a much simpler arrangement of the parts forming a steam engine was required before steam power could be applied practically to navigation.

In 1801 Symington was employed by Lord Dundas to construct a steam boat, and having by his former failures learned what was required, he availed himself of the great improvements recently made in the steam engine by Watt and others, and constructed an improved engine in combination with a boat and paddle-wheel, on the same plan which is now, and has since that period been universally adopted. This boat, called the "Charlotte Dundas," was the first practical steam boat, and for the novel combination of all the parts Symington obtained a patent on the 14th October, 1801 (No. 2544).

For some years prior to 1787, Patrick Miller, Esq., of Dalswinton, Scotland, had been engaged in constructing and experimenting with double and triple vessels, propelled by paddle-wheels, worked by manual labour. In the experimental trips of 1786 and 1787 he was assisted by Mr. James Taylor (the tutor to his two younger sons), and at

his suggestion it was determined to substitute steam power for manual labour For this purpose, in the early part of 1788, Taylor introduced William Symington, an engineer at Wanlockhead Lead Mines, who had previously obtained letters patent (dated June 5, 1787, No. 1610) for "his new invented steam engine on principles entirely new." An arrangement was made with Symington to apply an engine, constructed according to his invention, to one of Mr. Miller's vessels; and in consequence thereof, the engine which forms the subject of this memoir was made.

The following account is taken from the copy of a memorial presented by Taylor in 1824, to Sir Henry Parnell, the chairman of a Select Committee of the House of Commons:—"At this time William Symington, a young man employed at the Lead Mines at Wantlockhead, had invented a new construction of the steam engine by throwing off the air pump. I had seen a model work, and was pleased with it, and thought it very answerable for Mr. Miller's purpose. Symington had come into Edinburgh that winter for education. Being acquainted with him, I informed him of Mr. Miller's intentions and mine, and asked him if he could undertake to apply his engine to Mr. Miller's vessel, and if he could, I would recommend him; he answered in the affirmative, and from friendship I recommended both himself and engine; and afterwards introduced him to Mr. Miller. After some conversation, Symington engaged to perform the work, and Mr. Miller agreed to employ him. It was finally arranged that the experiment should be performed on the lake at Dalswinton, in the ensuing summer (1788). Accordingly in the spring the classes of the college broke up, I remained in town, to superintend the castings, &c., which were done in brass by George Watt, founder, back of Shakspeare-square. When they were finished, I sent the articles to the country, and followed myself. After some interval, I took Symington with me to Dalswinton to put the parts together. This was accomplished about the beginning of October, and the engine, mounted in a frame, was placed upon the deck of a very handsome double-pleasure boat upon the lake. We then proceeded to action, and a more complete, successful, and beautiful experiment was never made by any man, at any time, either in art or science. The vessel moved delightfully, and, notwithstanding the smallness of the cylinders (4 inch dia.), at the rate of five miles an hour. After amusing ourselves a few days, the engine was removed, and carried into the house, where it remained as a piece of ornamental furniture for a number of years."

The boat was 25 feet long and 7 broad; and was propelled by two paddle-wheels, placed one forward and the other aft of the engine, in the space between the two hulls of the double boat.

On the death of Mr. Miller, in 1815, the engine came into the possession of his eldest son, Mr. Patrick Miller; and in 1828 it was sent by him, packed in a large deal case, to Messrs. Coutts and Co., bankers, of 59, Strand, London. In this establishment the engine was kept until February 17, 1837, on which day it was removed to the store warehouse of Messrs. Tilbury and Co., 49, High-street, Marylebone. Here it remained till the 31st of January, 1846; and then it was forwarded to Kenneth Mackenzie, Esq., of 63, Queen-street, Edinburgh. Beyond this the engine could not be traced for a period of several years: the search for it, however, was never given up by Mr. Woodcroft. On the contrary, he instituted inquiries from time to time, in various quarters, and at last had the good fortune to discover the following information respecting it. Mr. Mackenzie received the engine on the 3rd of February, 1846, and kept it for some time; he then sent it for storage to Mr. Peter S. Fraser, agent to the United Kingdom Insurance Company, of George-street. Edinburgh; and finally he instructed Mr. Fraser to sell it. Accordingly the engine in its framing (as represented in the plate facing page 38 of Mr. Woodcroft's treatise on steam navigation) was sold by Mr. Fraser to his brother-in-law, the late Mr. William Kirkwood, plumber, of West Thistle-street, North-lane, Edinburgh, who removed the engine from the framing, and threw it into a corner, for the purpose of melting; this intention, however, was not carried into effect, doubtless owing to the death of Mr. Kirkwood. It was subsequently found to be in the possession of Messrs. William Kirkwood and Sons, from whom it was purchased and despatched to the Great Seal Patent Office, on the 19th of April, 1853. Subsequently it was transmitted to Messrs. John Penn and Sons, engineers, of Greenwich, who kindly and gratuitously undertook to reinstate it in a frame, and put it again in working order, as an object of great public interest. The engine was returned to Mr. Woodcroft, as good as new, January 4th, 1855; and on the 29th of January, 1857, it was removed from the Great Seal Patent Office to the Patent Museum at South Kensington.

The engine comprises several features of remarkable interest to engineers. The upper part of each cylinder is enlarged, so as to prevent the overflow of the water used for keeping the piston steam-tight, upon the plan used by Newcomen. The lower

part of each cylinder is Watt's condenser and air-pump, not separated from the cylinder, as patented by Watt, but attached to it. The valves are opened and closed by an improved arrangement of Beighton's hand-gear. A T-head or crosshead is applied to the end of the piston-rod, apparently for the first time. The rectilinear movement of the piston is converted into circular motion by a contrivance patented in England, but not in Scotland, by Wasbrough. To Symington, credit must be given for combining these improvements in the same engine.

The success of the experiments beforementioned induced Mr. Miller to give Symington instructions to make a larger engine. Accordingly a steam engine, with cylinders of 18 inches diameter, was constructed in 1789, and fitted in a vessel of 30 tons burden, belonging to Mr. Miller; and in the experiments made with this vessel, a speed of from 6½ to 7 miles an hour was obtained. Mr. Miller now discontinued his steam-boat experiments, as it appears that he was not satisfied with the engines constructed by Symington, on his patented plan of 1787; for in a letter written by him to Taylor, on the 7th December, 1789, he says, "I am now satisfied that Mr. Symington's steam engine is the most improper of all steam engines for giving motion to a vessel, and that he does not know how to calculate frictions or mechanical powers." In the spring of 1790 Mr. Miller applied, through Mr. Robert Cullen (afterwards Lord Cullen), to Messrs. Boulton and Watt for engines, making an offer for them to unite with him in his scheme of steam navigation. The subjoined reply of the celebrated James Watt is interesting, as it exhibits his doubts of the practicability of steam navigation:

"*Birmingham, April 24th*, 1790.

"Dear Sir,—We have heard of Mr. Miller's ingenious experiments on double ships from Sir John Dalrymple, and also some vague accounts of the experiments with the steam engine, from which we could gather nothing conclusive, except that the vessel did move with a considerable velocity.

"From what we heard of Mr. Symington's engines, we are disposed to consider them as attempts to evade our exclusive privilege; but as we thought them so defective in mechanical contrivance as not to be likely to do us immediate hurt, we thought it best to leave them to be judged by Dame Nature first, before we brought them to an earthly court.

"We are much obliged to Mr. Miller for his favourable opinion of us and of our engines, which we hope experience would more and more justify. We are fully sensible of his kind intentions in offering to associate us in his scheme; but the time of life we have both arrived at, and the multiplicity of business we are at present engaged in, must plead our excuse for entering into any new concern whatsoever as partners; but as engineers and enginemakers, we are ready to serve him to the best of our abilities at our customary prices for rotative engines, and to assist in anything we can to bring the scheme to perfection.

"We conceive that there may be considerable difficulty in making a steam engine to work regularly in the open sea, on account of the undulating motion of the vessel affecting the *vis inertiæ* of the matter; however, this we should endeavour to obviate as far as we can.

"It may not be improper to mention that Earl Stanhope has lately taken a patent for moving vessels by steam, but, we believe, not by wheels. His lordship has also applied to us for engines; but we believe we are not likely to agree with him, as he lays too much stress upon his own ingenuity.

"We cannot conclude without observing that, were we disposed to enter into any new concern whatever, there is no person we should prefer to Mr. Miller as an associate, being fully apprised of his worth and honour, and admirers of the ingenuity and industry with which he has pursued this scheme.

"Permit me now, Sir, to return you my thanks for your obliging attention to me, and for the trouble you have taken in this affair, and to ask the favour of you to present Boulton and Watt's respectful compliments to Mr. Miller.

"I remain, dear Sir,

"Your obliged humble servant,

"James Watt.

"Robert Cullen, Esq., Edinburgh."

After this, Mr. Miller abandoned the subject of steam navigation, and devoted his attention principally to agriculture. Symington, however, in 1801, found a patron in Lord Dundas, who employed him, as before stated, to make a series of experiments; and the result was the production of the first practical steamboat, the *Charlotte Dundas*. "In this vessel there was an engine with the steam acting on each side of the piston (Watt's patented invention), working a connecting rod and crank (Pickard's patented invention) and the union of the crank to the axis of Miller's improved paddle-wheel (Symington's patented invention). Thus had Symington the undoubted merit of having combined together for the first time those improvements which constitute the present

system of steam navigation."—(Woodcroft on Steam Navigation, page 54.)

Much interesting information relating to the engine of which we have now given the history, and to the experiments which led to the application of steam power to the propulsion of vessels, will be found in the following works:

A pamphlet entitled, "The Elevation, Section, Plan, and Views of a Triple Vessel, and of Wheels, with Explanations of the Figures in the Engraving, and a short account of the Properties and Advantages of the Invention. By Patrick Miller, Esq., of Dalswinton, Edinburgh. Printed in the year 1787."

Dumfries Newspaper, October, 1788.

Edinburgh Advertiser, October 24, 1788, page 270, first column.

Lloyd's Evening Post (London), October 27, 1788.

Scot's Magazine, November, 1788, vol. l., page 566.

Journal of the Royal Institution of Great Britain, vol. i., page 195, 1802.

Memorial presented by Mr. Taylor in 1824 to Sir Henry Parnell, the chairman of a select committee of the House of Commons.

Edinburgh Philosophical Journal, July, 1825.

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WILKINS' APPARATUS FOR LAYING SUBMARINE TELEGRAPH CABLES.

Mr. W. Wilkins, of the firm of Wilkins and Weatherly, rope-makers, Wapping, has obtained provisional protection for an invention which consists in the use of a flexible tube or trail, attached to the stern of the ship from which the cable is laid, the cable being passed through this tube on its way into the sea.

Trails can be constructed in various ways, and may, if desirable, be made of the same specific gravity as the cable itself. "A wire rope with a light metallic vertebrated tube in the centre," says the inventor, "would probably answer well. It may be partially sustained in the water for the first half mile from the ship by small gutta percha buoys made in the form of a fish's float, attached to it at intervals, or by an air-tight gutta percha tube. A strong gutta percha tube, strengthened for the first half mile from the ship with a covering of wire, would also be a good conductor. It should be of sufficient length to reach into still water at such a distance from the ship as would place the extreme end beyond the influence of any motion which may be given to the inner end by the pitching of the ship, or from any other cause; or it may be of sufficient length to reach to the bottom of the ocean. The trail being, as it were, part and parcel of the ship, acts as a carrier for the cable, and thus virtually annihilates the distance between the ship and the bottom of the ocean, or still water, except to the extent of the friction of the cable in the tube; and as the motion at the extreme end of the trail would be steady and uniform in its passage through the water (the speed of the ship being uniform, however unsteady its motion), the delivery of the cable would also be steady and uniform; and as the cable cannot enter into the tube at the upper end faster than it passes out of it at the lower end, it follows that any strain which otherwise would be thrown on the cable at its point of contact with the ship, from any cause whatever, would be borne by the trail itself, instead of by the cable. In fact, the cable in its passage through the tube, is completely protected from any strain, and from all other circumstances which might be injurious to it. To obtain the proper declivity for the trail, it would be

only necessary to ascertain the velocity at which the cable would sink in the water, and, after making due allowance for the increasing or diminishing depth of the ocean, to regulate the speed of the ship accordingly. The friction of the cable in the tube would act as a brake, with the great advantage of its operating throughout the entire length of the tube, instead of on a few yards or fathoms of the cable on board the ship. Without enumerating all the advantages that would attend the use of a trail, it may be well to observe that its adoption will enable a comparatively inexpensive description of cable to be used, as great strength would not be required. The insulation of the telegraphic wires would, perhaps, scarcely need any other protection in deep oceans than would be necessary to prevent abrasion in its passage through the tube."

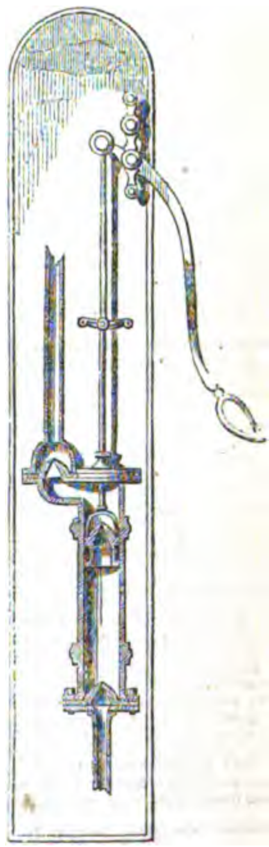
PERREAUX'S PATENT INDIA-RUBBER PUMP-VALVE.

We have recently had submitted to our inspection an India-rubber pump-valve of very simple construction, and most efficient action. It is constructed entirely of India-rubber, vulcanized for the purpose, and takes the form of a tube flattened at one extremity, something similar to the mouthpiece of a hautbois, and approaching as nearly as possible in form and action the valves of the human heart. The thickness of the sides of the upper part diminishes gradually to the top, where the two sides meet and form two lips, which, when the valve is in a state of rest, are in close contact, and prevent the downward passage of the fluid, as shown in the cross section, fig. 1, and side elevation, at fig. 2.

Fig. 1.

With any upward pressure, the lips freely separate, and allow of the upward passage of the fluid. The gradual tapering of the sides forming the lips of the passage, enables the valve to open and close with the slightest variation of pressure, and, by properly proportioning the parts, to resist any required amount of downward pressure. The passage for the fluid is larger in these valves than in others of equal dimensions; they also possess the advantage of having a "clear way," there being nothing whatever to retard the passage or flow of water, and, owing to the self-acting principle imparted by the elasticity of the material, they close perfectly and instantaneously the moment the pressure from below ceases.

Fig. 2.



The lips of the valves being flexible and elastic, any such substance as sand, gravel, coal, dust, chips of

wood, &c., passes freely through without deranging the action of the valve, and liability to choke is therefore removed. A further advantage these valves possess is, that however long the pump may remain dry, they require no priming by the application of water, &c., to make them act. They will work equally well in any position, whether vertical or horizontal, and the material of which they are constructed resists the action of acids, alkali, sea-water, spirits, liquid manure, ammonia, heat or cold, &c. A section of an ordinary lift-pump, to which the valve is applied, is shown at fig. 3.

In France, where the improved valve was invented, its success has already been well established, and the inventor, M. Perreaux, was awarded the silver medal for 1856, at the *Exposition d'Agriculture*. The valve has also been extensively adopted.

THE AIR PUMPS OF STEAM ENGINES.

A mode of separating the work of clearing the condensers of steam engines of air, and drawing out the condensed water, has been proposed by Professor Thomson as follows:—It appears to be an ill-arranged plan to pump out air and water in not very unequal volumes, with a large proportion of watery vapour besides, which is the work allotted to the *air* pump, so called, of an ordinary condensing engine; and true economy would probably be found in a division of labour. Whether surface condensation or injection be used, the air and water to be drawn out might readily be separated by having a *water* pump employed to draw from the bottom of the condenser, of very little larger capacity than would be sufficient for all the water to be pumped out, and by having also a branch pipe from the condenser near the top leading upwards to an *air* pump, this pipe being specially cooled by a separate refrigerating stream of water to itself, so that the temperature in it might be lower than it is practicable to attain in the condenser, as low in fact within a degree or two as that of the cold water supply. There would thus be a much more perfect condensation in the pipe than in the condenser, and the condensed water would run down it, leaving above at the entrance to the air pump chiefly air at the same pressure as the vacuum in the condenser. In an ordinary steam engine with injection, there would be a risk of the water rising in the condenser and choking the air pump; but this might be avoided by supplying the condenser with a glass gauge, so that if the water rose too high the injection stream might be diminished. Where surface condensation is used, it would still be desirable to be able to regulate the height of the water in the condenser; and for this purpose some plan of adjusting the feed pump to make it draw more or less as required would be advisable, so that the pump might draw off just enough to prevent a rise of water in the condenser.

THE STEAM PORTS OF STEAM ENGINES.

Mr. J. P. Joule, F.R.S., suggests that it would be very desirable to abandon the practice of using the same port for both the induction and eduction of the steam to and from the cylinder, since by this method the temperature of the exhaust steam is raised by coming in contact with metal which was the instant before heated by the induction steam, and the induction steam is cooled by contact with metal which has just before been exposed to the exhaust steam. No doubt a loss of elegance and compactness would result from employing separate ports, but this would be far overbalanced by the real advantages gained.

THE CONSERVATON OF FORCE.

The letter of Mr. Benjamin Cheverton, which we inserted last week, bears internal marks of being, to some extent at least, an authorised defence of Faraday as well as of himself. On this account we the more readily gave it admission. Mr. Cheverton objects *in limine* to descending to what he is pleased to call a "wordy personal warfare." We are not conscious of having done more in this way than calling attention to the patent fact that our correspondent is no mathematician, which it is now evident he would consider an honour and distinction rather than the reverse. It is all very well, very high-minded, and so forth, to abjure personalities; but in the present case there is a personal aspect of the question which must be considered, and on which we have a right to some satisfaction. Faraday's claims to the character of a philosopher are known to all the world. We could bend the neck to the castigations of such a man if merited, and even his errors are entitled to a certain degree of respect. But Faraday has nowhere adopted the high exclusive tone of philosophical superiority which it has pleased Mr. Benjamin Cheverton to assume. He is too genuine a philosopher, and therefore too sensible of the possibility of error on his part, to adopt this arrogance of demeanour towards others. The tone of Mr. Cheverton's letter, then, forces upon us the question, By what mark may we know Mr.

Benjamin Cheverton to be a philosopher entitled, from his lofty pedestal, to lay down the law to mathematicians? The "*ipse dixit*" of an acknowledged philosopher of eminence is worth something; but by what is Mr. Cheverton entitled to lay the rod so unsparingly on the backs of mathematical philosophers, enjoying, many of them, a world-wide reputation? We have a right to ask this question, even though it be somewhat personal; for the greater part of his explanations being of the nature of simple assertions, must depend, in some measure at least, for their value on the answer we receive. Notwithstanding Mr. Cheverton's discovery that he had nothing to answer in our few strictures, he devotes a considerable space to an attempt to controvert our positions, to the more salient points of which we shall briefly draw the attention of our readers.

The first statement on which all the rest, more or less, hinge, carries us back to the pre-Galilean period, when the confusion of ideas on mechanical questions precluded all possibility of advance in mechanical science. We are informed that "wherever phenomena exist, of whatever kind, there force is present to produce them, whether it can be mathematically detected and measured or not." This statement, thus broadly made, implies the very confusion between the production and the preservation of motion which led Aristotle and his successors to such perplexities and inconsistencies. It is a very natural notion for light-of-nature philosophers, who despise or are ignorant of the march of mechanical philosophy during the last two centuries, to adopt; but it is a notion fatal to all clear perception of mechanical truth. We have no direct experience of any motion of bodies on the surface of the earth unless produced by force; for we cannot isolate a body and remove it from the action of some force or other; and it is hence natural to the uninitiated to conclude that where there is motion there must be force to maintain it. But the great merit of Galileo and Newton consisted in this, that they saw clearly and defined accurately the true relations of force to motion which are expressed in the first two laws of motion. To this emancipation of the philosophical world from the grave error of confounding these two things, due to their labours, we owe the progress of mechanical science, which must otherwise have remained—as it had been for centuries—stationary and useless. To go back, then, to the pre-Galilean confusion between momentum and force, is to undo the labour of the great philosophers of the last two centuries, to whom the science of mechanics is under such unspeakable obligations. We must be very sure of our ground before we consent to do this.

Again, we are told that force, being a "generic" term, must, "by a logical necessity," be "vague and indefinite." We do not know from what source M. Cheverton derives his principles of logic; but we are much surprised to hear that vagueness and indefiniteness is a logical characteristic of any philosophic term. A "genus" can be as correctly described as any particular species of that genus. There is a certain number of ideas which are included in every individual of a particular genus, however much individuals of that genus may differ in subordinate particulars; and the definition which connects these several ideas, and the term which stands for this definition, are quite distinct and clear: in true philosophy there is no place for ambiguity or vagueness. We need hardly say that "the more exact and scientific definitions" of force which Mr. Cheverton parades have no existence whatever in any system of philosophy since the days of Galileo. There are indeed different kinds of force, as attractive, repulsive, and the like; and different aspects under which the same force may present itself, as producing or altering motion, or tending only to produce or alter motion; but the grand philosophic idea of force is one, and only one, and can have nothing indistinct or indeterminate about it. There can be but two distinct measures of a force, viewed either as generating motion, or producing pressure in consequence of motion being prevented. These two measures also have a relation to one another, so that in fact, they may be reduced to one—as is frequently done by the French mathematicians. The other measures of force mentioned by Mr. Cheverton are either reducible to those we have brought forward, or are the measures of further consequences of force. The controversy as to whether force should be measured by momentum generated, or *vis viva* generated, which made so much noise during the first half of the eighteenth century, terminated, as our readers are no doubt aware, in the universal adoption of the former; and *vis viva* and its correlative work or duty have long since been relegated to that important, though secondary position which they occupy of consequences, or combinations of force with another element, and not of force itself. To disturb this arrangement, and to unsettle the labours of the profoundest thinkers the world has ever seen, is not only at the present day out of the power of any man to effect, but if it could be effected would be most injurious in its consequences.

Of the value of Mr. Cheverton's logical distinctions our readers may form an idea

by the following:—"Distance is space itself in its relation to two bodies, and momentum is force itself in its relation to two other ideas—mass and velocity." The meaning of this is not very apparent; but what meaning there seems to be is wrong. How space in its relation to two bodies can be simply distance, we cannot see. In the case of two bodies describing orbits round one another, even though in one plane, distance alone can be no proper measure of space.

Many of the terms now in use were invented at a time when incorrect notions of mechanics were generally current, and, as is frequently the case in similar circumstances, have been retained, although they no longer represent what they were originally intended for. Thus "*vis inertiæ*," meaning thereby a force residing in inertia, has not for two centuries been allowed by mathematicians—certainly not by philosophers. Were our terminology to be created in the present day, there is no doubt that it would contain no such term as "centrifugal force." There is, however, no difference of opinion whatever on these points among mathematicians; and it is somewhat late in the day to think of calling in the aid of philosophy, which has long since decided them.

Of light-of-nature philosophy—such philosophy, that is, as is adopted by the self-inspired, who despise the light of other days, and seek to spin out of their own unassisted brains a web to supersede that woven by the combined genius of several centuries;—of such philosophy the science of mechanics had a surfeit through many ages, and to such diet she has no desire to return.

The most amusing trait of Mr. Cheverton's letter, is his contemptuous treatment of mathematicians, and the high pinnacle of superiority from which, being a philosopher but not a mathematician—having all the measures of force he has enumerated in his mind when he speaks simply of force, which is confessedly in this system a *general* generic term, vague and indefinite—he thinks himself entitled to look down upon the mathematician, who has not only studied the philosophy of mechanics, but has learnt, moreover, to express the great truths his philosophy has taught him in their appropriate language. With this trait we must be content to be amused; it will not bear serious argument.

Mechanics has been, and is, a progressive science, and undoubtedly at former periods even profound mathematicians, like Euler, have fallen into error, not from failure in the manipulating of their symbols, but simply from the circumstance that the mechanical principle of the particular branch of the science on which they erred had not been settled on a satisfactory basis. This is no valid objection to mathematics. No science is the growth of a day; the principles of no science, in their fulness, were at once developed. We are not aware, however, that we are indebted to any "heaven-born philosopher," such as Mr. Cheverton delights in, for any of the received great principles of mechanical science. We have never known the gift of rightly understanding nature, and of interpreting her teachings in appropriate language, severed.

A light as to Faraday's possible meaning in his celebrated lecture, which is certainly adopted by his follower, Mr. Cheverton, begins, however, to dawn upon us, and to fill us with amazement; it is that mathematicians in the enunciation of the law of gravity "assign to distance itself, purely as distance, any influence." In the mathematical definition of gravity, a *fact* which is most satisfactorily proved, is expressed, namely, that the force varies inversely as the square of the distance; and this is all that is required for the purposes of calculation. That this enunciation contains any account whatever of the mode of action of gravity—of the causes on which it depends—and the way in which the influence of distance is felt, never entered into the head of a mathematician.

No thoughtful student, perhaps, ever investigated the consequences of the law of gravity without speculating on its probable causes, and probably to at least as good effect as our light-of-nature philosophers. But while these causes are, at present at all events, necessarily a mere matter of speculation, the law itself is an undoubted verity; and until the time shall come when the true causes of attractive force shall be established on a satisfactory basis, it would be premature and unphilosophical to attempt to combine the scientific and metaphysical accounts of gravity in one definition—to join the *verum* with what is at the best only *verisimile*.

To the Editor of the Mechanics' Magazine.

Sir,—Your correspondent, Mr. Cheverton, was told—and I think properly—that his first communication on this subject contained no appreciable argument. Out of a spirit of retaliation, he now retorts on his opponents that he can find in their criticisms no "single argument advanced." He therefore makes his present letter a grand flourish of trumpets in honour of his supposed victory, and in proclamation of the defeat and downfall of his adversaries—the mathematicians of every age and country. Mr. Cheverton, I hope, will not esteem me

impertinent if I hint that his exultation, like his theories, has no foundation whatever in fact. He certainly succeeded in producing a letter the arguments of which, whatever they may be, no one would attempt to combat; for, in their masquerade, one could recognize in them neither friends nor enemies. So that the question in dispute remains *in statu quo*, exactly as if he had never written on the subject. Let me remind him that on his side lies the onus of proving his case. The arguments on our side are extant in all scientific works relating to the subject. If these are to be overthrown, there will be so very much to do to effect their ruin, that it is very bad economy on the part of your correspondent to waste his time in the harmless pursuit of writing such letters as his last.

In what I have said, and in what I am about to say, I feel that I am departing from the original subject of discussion; but I can take no other course, because, standing on the defensive, I am obliged to direct my forces to the place of attack. With your permission, then, Sir, I will just notice a point or two in his letter, which your correspondent appears to think important.

His views of a generic term I think quite erroneous. The subject is of primary importance; for a proper generalisation is the one thing needful in all branches of physical science. We are told that a generic term is, from a logical necessity, vague and indefinite. From this I beg to be allowed to dissent. It is the one object of science to make its generic terms definite. To investigate and examine the multitudinous phenomena of nature; to find out wherein they differ from, and wherein they resemble each other; to class the like together, and place the distinct apart; such are the pursuits of the natural philosopher. In this process of classification he applies a generic term to a family of facts which are ascertained to be alike in a common characteristic, however much they differ in other respects. The inductive philosopher —the only philosopher of truth who stands any chance of "seeing facts as they are" —does not descend into particulars, as Mr. Cheverton seems to do, but begins with particulars, and ascends into generalisations. A general term, then, if it pretend to have any relation to science, must not be vague and indefinite, but must admit of exact definition. It can only be employed to designate a number of facts or phenomena which have a common characteristic, the statement of which common feature contains the definition of the generic term.

Language itself has been constructed by means of a rude application of this method. But scientific and correct classification of things has not kept pace with the growth of our nomenclature, and we have many names, the use of which is founded on a false generalisation, and we have many instances of separate names founded on a false distinction. If language had not had these faults, cultivators of natural science would now have had little left them to do, and there would have been no discrepancy between popular and technical, or scientific, phraseology. Actually, however, there are very important differences between the popular and scientific acceptations of the same words. Scientists have in some cases introduced or coined new words to serve their turn, but they have mostly narrowed the signification of terms already in use to make them serve a technical purpose. This narrowing, limiting, defining process at which Mr. Cheverton sneers so freely, is what scientific men have been occupied with ever since science was born, and it is a process they will continue to carry on while they retain an intellect to labour and arrange, and a thirst for knowledge to be gratified. Accuracy, which Mr. Cheverton appears to regard as identical with narrow mindedness and limited vision, is not inconsistent with the use of generic terms, for the individuals of the group of things associated under the generic name can be separately enumerated, and their common qualities, which give rise to the classification, clearly defined. Vagueness, then, in spite of Mr. Cheverton's dictum, does not necessarily belong to a class name. A generic term is vague only when its use is grounded on a mistaken generalisation, as is the case with the word force as commonly applied, and as employed by your correspondent. Popularly it is used to denote pressure, momentum, *vis viva*, inertia and *je ne sais quoi*, on no very well-ascertained principle. If Mr. Cheverton will, in these different things point out the common principle which forms the reason of their association, and confine his generic term to denote their similarity, I should have no objection to make, except that it would be better if he could find another word for his purpose. But I suppose this would be a method too mathematical—too exact, or, rather, as he would designate it, too narrow and too limited for him to shackle himself with. He prefers to have his symbols vague and undefined, in order that he may at his convenience, and without seeing his own mistake, predicate of a class what is true only of an individual member. In the variety of things which your correspondent links together by the generic term force, I can discern no family likeness whatever, though he asserts that they are substantially the same. But what good end will his mere

assertion serve, and how will it advance the establishment of his position, if he do not condescend to point out precisely wherein the identity consists? He, however, seems to regard his own assertion as strict argument, and follows it up by saying, "It is not correct, then, to say, 'that momentum and force are essentially distinct ideas.'" I must still humbly submit that it is correct to say this, notwithstanding. Even if I follow his own lead, and treat the word *force* as synonymous with *cause*, I do not see how momentum can be regarded as force. Force, we are told, is the name of the agency or cause which produces any natural phenomena. If this be a complete definition, Mr. Cheverton is certainly not justified in applying the term to the effect as well as to the cause. Now momentum stands in the place of the effect, and therefore may not correctly nor conveniently receive the designation of its own cause. But in all this, Sir, we have a discussion about mere words, in which ideas play but a minor part. To continue this, I am quite sure, would be neither acceptable to you nor creditable to me. I therefore promise to interfere no more with your correspondent's recreation while it is of so harmless a species. I have, however, one or two observations of a different character to make.

Your correspondent looks upon the present dispute as a quarrel between mathematicians and philosophers, and upon himself as the champion of the latter. He is indignant that the philosopher should be treated as a poacher, when in truth he is simply hunting on his own grounds. Almost the whole of his pleading is made up of indignation; there are few, if any, arguments in it. In this discussion the champions on both sides are, perhaps, unworthy of the places they have presumed to take. The self-appointed advocate of self-styled philosophers has clearly proved himself extremely ineffective. To carry out his own poaching metaphor, and indicate his own place in the picture, I should say that it is that not of a poacher or trespasser, but of a spiteful, though cautious individual, who, refraining from entering the preserves, satisfies his envious ill-humour by abusing the gamekeeper, and making faces at him over the fences.

There is one part of the letter, however, which presents at least the form of argument. Two facts are given to prove that mathematicians are generally deficient of philosophical acumen. 1st. Euler, a consummate mathematician, once made a mistake. 2nd. Mr. Cheverton himself has proved all modern mathematicians wrong in the matter of the oar problem. Fact number one may be real enough for anything I know, but it does not justify your correspondent's conclusion. It merely proves that mathematicians, like other mortals, are not infallible. Do philosophers never make mistakes? Why Mr. Cheverton himself, who is the champion of philosophers, has made the mistake of supposing that the above statement, marked number two, is a real fact. For my part, I am surprised that he has not yet recovered from this his old hallucination.

About the passage from the Report of the Cambridge Board I cannot be expected to know anything, as indeed I do not. But for all that, I have no doubt that it was inserted in that report, because the students had fallen into errors akin to the notions which your correspondent's writings exemplify. So that this passage properly would deserve his condemnation, not approbation.

For a just criticism of the "lines of force," I refer your correspondent to your editorial articles on this subject, published about a year ago.

I am, Sir, yours, &c.,

A MECHANIC.

ROYAL NAVY TONNAGE.

To the Editor of the Mechanics' Magazine.

SIR,—As the question of the tonnage of the merchant navy, with reference to the duties to be levied on the different ships composing it has been satisfactorily settled, the question of Royal Navy Tonnage, mooted by "Crescens" in No. 1762, may not be thought unworthy the attention of those gentlemen who have lately so ably discussed the requirements of a Merchant Tonnage Act, and who will at least be able to decide whether or not it is expedient to have registered some other index of a ship's size than that given by the builder's tonnage.

It is, as "Crescens" very properly remarks, perfectly ridiculous to make use of the builder's tonnage in any calculations, or by way of comparing one ship with another, since that tonnage represents nothing in reality—a fact which most persons are well aware of, although, on account of its simplicity, and the difficulty in obtaining a better, it is retained in the navy as well as by shipbuilders generally, for the purpose of buying and selling ships.

I have never heard of its being used in any kind of calculations made on ships in the Royal Navy, at least by those whose business it is to make them, since they have at their command the complete forms of all ships, from which the necessary calculations may be, and in fact are made, although for obvious reasons not made pub-

lic. I believe, then, it is only used for the purchase and sale of ships, which end could be answered equally well by making use of the yard, foot, or inch, of the length or breadth; for, if we find in several cases two deckers and three deckers perfectly identical in form (excepting that the latter have an additional deck), and consequently giving the same builder's tonnage, the price per ton of the one must be very different from the price per ton of the other.

The PROBABLE RATIONALE of the old rule has been given by Mr. Parsons, a member of the late school of naval architecture, in a pamphlet entitled "An Explanation of a Correct Method of Admeasuring Ships for Tonnage," &c.; published about thirty years ago, and which, Sir, I will reproduce for the benefit of those who may not have seen it.

"It is well known that any body floating in a fluid, displaces a volume of that fluid, the weight of which is equal to the whole weight of the floating body. Thus, a ship floating in water displaces a volume of water which is equal in weight to the weight of the ship, and everything on board. This displacement of a ship, or the whole weight of the stores, cargo, and everything on board, together with the weight of the hull, must always bear some relation to the principal dimensions of the ship, namely, length, breadth, and draught of water, or to L, B, and D. Now it is known from calculations on vessels with rather full forms for burthen, that the displacement, estimated in cubic feet of sea water, is equal to sixty-two hundredths of the product of these three dimensions, or to $L \times B \times D \times {\cdot}62$; which, being divided by 35, the number of cubic feet of sea water which weigh a ton, will give the displacement in tons $= \frac{L \times B \times D \times {\cdot}62}{35}$.

The draught of water of men of war is generally about half the extreme breadth of the ship, and no doubt at the time of the formation of the rule for tonnage, it was in the same proportion in merchant vessels; but being omitted in the rule for tonnage, this dimension has very much increased of late years, without a relative increase in the length and breadth; therefore, instead of D, substitute what was formerly its equivalent $\frac{B}{2}$ and the expression becomes

$$\frac{L \times B \times \frac{B}{2} \times {\cdot}62}{35}$$

= whole displacement or weight of the vessel in tons. The weight of the hull, stores, &c., was generally about two-fifths of the whole weight, leaving three-fifths for the weight of the cargo, or burden. Therefore

$$\frac{L \times B \times \frac{B}{2} \times {\cdot}62}{35} \times \frac{3}{5} = \frac{L \times \frac{B^2}{2}}{94}$$

= burden in tons, which is the common rule."

The rule, therefore, may have been occasionally right in those days in the merchant navy, which it never happens to be now, at least in the Royal Navy; and that which is so useless had much better be swept away than retained.

Until very recently the constructors of ships for the Royal Navy were restricted in the designs for the various rates to fixed tonnages measured by the builders' rule, and this recognition of the rule has probably operated very strongly in causing the Government ships to be registered according to it.

A ship's tonnage ought properly to be expressed by the number of tons weight she is able to carry, that is, by the number of tons displacement between the light and load water lines, which could be ascertained very accurately provided the position of these lines were fixed; but it is in the fixing of them that the real difficulty lies.

Many think that the light and load lines are as invariable and as well defined as are any of the dimensions of the ship, and I believe no one but an experienced person is alive to the difficulties there would be in determining these lines, even in ships of the Royal Navy; consequently the reasoning founded on the assumption that these lines are fixed goes for nothing; and I am certain that were a system of tonnage so formed, the result would be, instead of our being able to draw any comparisons between ships, we should find nothing but confusion, and our position would be worse than that blissful one of ignorance in which we are at present.

I am afraid, Sir, I have already exceeded the ordinary limits of a letter; but I cannot close without stating what rule I believe would be found most useful to all interested in shipping affairs.

The only useful and practicable mode of registering ships of war seems to me to be of the kind adopted in the Act of 1854; or in measuring the whole of the internal capacity, including the space under the poop and the entire engine room, and dividing the result, in cubic feet, by 100, or if preferable, by some other more suitable number.

We should then have the relative sizes of all ships of war expressed by the numbers resulting from the operation above de-

scribed, which may be aptly termed their *metrical tonnages.* Having for any ship the metrical tonnage, the horse power of the engines, the number of guns, and the weight of metal thrown at one broadside, we may form a very correct idea of her size and power, which cannot now be obtained without a knowledge of her principal dimensions.

I do not pretend that this will be unobjectionable, nor that it will be more readily found than the tonnage by the old rule. After it has been found, however, it will mean something, and will form a tolerable index to the cost of vessels; certainly much better than the tonnage it is proposed to replace. It will not advance the science of naval architecture one step: if this be attempted by any system of tonnage, it will most assuredly fail: improvement there will only follow careful comparisons of the forms and performances of numerous examples.

With many apologies for the length of this letter,

I am, Sir, yours, &c.,

AN ARTIFICER.

London, May 23, 1857.

AERIAL NAVIGATION.

To the Editor of the Mechanics' Magazine.

SIR,—In reply to the letter on balloon navigation, published in your *Mechanics' Magazine* for May 16, I would say that it appears to me, that the principle of the balloon is at once thrown aside when we think of propelling it through the air. As long as it follows the current it is all very well, but when once you attempt to move such a large body out of or through that current, a resistance is at once met with which the soft body of the balloon is little able to bear. Beside, how is that force to be applied? If from the car, I should say it would merely have the effect of making the balloon descend. Let your correspondent try to draw through the air, when there is wind, one of the small balloons we see everywhere; let him fancy his hand to be the car, and then he will find that the balloon will fall nearly to the same level as his hand, and will easily conceive that it must descend, and so on, until it reaches the ground; and then if he thinks of applying an apparatus at the point of an elongated balloon, in what manner is it to be applied? Certainly not from the car; for if he uses cords for the purpose, they will merely pull the point of the balloon down, if the weight of the apparatus does not do so before hand. Then paddle wheels are quite out of the question. They could not supply the least force, for they have only one element to act in, and will therefore pull as little in one direction as the other. The precaution for the dark may well be spared, as it is impossible for two balloons to meet; they must both follow the current of air, as their sustaining force presents a large proportionate surface, out of the current they cannot go. Perhaps some little effect might be obtained on a perfectly calm day; and even then it must proceed at a very slow rate, and be of no practical use. I quite agree with the principle that the balloon will reach its maximum of speed when the atmospheric is equal to the propelling power; but that will be at the first start; and if it were not so it would only act as I stated before, when applied, as it must be, from the car; that is, to make the balloon descend gradually, or by collapsing it altogether; and the idea of applying engines would make matters worse, as an increased size of balloon would be required to support them in the air; besides, an elongated balloon could not give steadiness. The moment the weight was greater at one end than the other, that end must dip; and if the weight were at both ends, the balloon would be bent in two; so that I can see no practical manner of balloon navigation, except in the old way, that is, to go with the current of air.

I am, Sir, yours, &c.,

AN AMATEUR.

London, May 24, 1857.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

PELLEN, M. *Rendering impermeable by gas, caoutchouc, gold-beaters' skin, paper, gauze, and similar materials used for things adapted to receive an ascending force, such as balloons, aerostatic machines, toys, &c., &c., by the application of a peculiar varnish.* Dated Sept. 26, 1856. (No. 2256.)

The different kinds of varnish employed in this invention are composed of amylaceous substances, such as gum arabic, adragant, mucilage, and vegetable substances mixed with some kinds of gum, sugar, gelatine, dextrine, glucose, albumen, or collodium.

RENSHAW, C. *Improvements in squeezing-rollers applicable to machinery or apparatus for pressing or partially drying yarns and woven fabrics.* Dated Sept. 26, 1856. (No. 2257.)

This consists in covering the squeezing rollers with caoutchouc, or similar elastic substance, between which the damp goods pass to be more effectually pressed. And for more effectually pressing yarn in the hank or warp, which are thicker in the centre than at the edges, the flexible substance which covers the rollers is made

much stronger in the centre than at the edges.

HORSFALL, W. *An improvement or improvements in cards for carding fibrous substances.* Dated Sept. 26, 1856. (No. 2258.)

This consists in a combination of materials for the backs or foundations of cards. The materials combined are a cloth formed of linen warp and woollen weft, and a thin sheet of caoutchouc; or a cloth formed entirely of wool, together with a fabric which may be composed wholly of linen, or of linen and cotton and a thin sheet of caoutchouc; or the woollen card cloth is coated with a sheet of india-rubber, or with layers of strong india-rubber solution.

WOODWARD, G. G. *Improvements in the manufacture of carpets.* Dated Sept. 26, 1856. (No. 2259.)

This consists—1. In the application of certain improvements patented by the patentee the 26th Oct., 1853. He applies a combination of self and parti-coloured warps to the manufacture of Kidderminster and Dutch carpets. 2. In working self colour and parti-coloured warps in the manufacture of velvet Brussels and Dutch carpets to the same reed of the slay, that is above and below each other, rising as the pattern requires. 3. Of improvements in dyeing parti-coloured warps, by means of a number of expanding slides, each pair being fastened to cheek-plates, and fitted on a main shaft supported by a suitable framing.

NEALL, G. *An improved union gas stove for lighting and heating.* Dated Sept. 27, 1856. (No. 2263.)

This has a twofold purpose, that of combining a gas stove with a gas lamp, thus effecting lighting and heating by the same apparatus, which is so constructed as to consume the nauseous vapour usually thrown off.

BOYD, J. *Improvements in letter-press printing machines.* Dated Sept. 27, 1856. (No. 2264.)

The object here is so to construct letter-press printing machines that they shall be capable of printing (by the use of coloured inks and inking apparatus) any bill, poster, &c., in as many colours as there may be inks and inking apparatuses applied.

LAW, D., and J. INGLIS. *Improvements in moulding or shaping metals.* Dated Sept. 27, 1856. (No. 2265.)

This consists in a general arrangement of machinery—in giving vertical and rotatory motion, derived from the same source, to the rammer spindle by means of the gripping box and connections therewith—in a means of forming the faucet or socket portion of pipe moulds by scooping or shaping machinery, and in a mode of arranging the parts of mould carriages.

SMITH, W., and N. F. TAYLOR. *Improvements in apparatus for measuring gas and other fluids, and in regulating the flow of the same.* Dated Sept. 27, 1856. (No. 2266.)

This relates to the parts forming the diaphragms of gas meters, and consists in forming them of several pieces or plates converging to a common centre; also to effecting the correct motions of the several parts of such diaphragms, by the application of a slotted piece at the point of connection of two of the parts; also in constructing the seat of each valve for governing the passage of the gas in connection with two measuring compartments and four passages.

RANSOME, F. *Improvements in the manufacture of artificial stone, and in rendering it and other building materials less liable to decay.* Dated Sept. 27, 1856. (No. 2267.)

The substances used to produce artificial stone are sand, clay, or other mineral or earthy substances, together with soluble silica, or a soluble silicate. For preserving stone, pumice stone or a readily fusible glass is mixed with various ingredients and spread upon the stone, which fills the pores thereof and arrests decay.

EDWARDS, J. *An improved ship's log.* (A communication.) Dated Sept. 27, 1856. (No. 2269.)

In this case the dial log and log ship are separate from each other when out of use, and apart when in use. The dial log indicates the speed of the ship. It is placed on the taffrail, cabin table, or other convenient place.

ROTHWELL, J. *A certain composition and preparation to promote the ignition and combustion of coke, coal, and other combustible substances in stoves, furnaces, and grates.* Dated Sept. 27, 1856. (No. 2270.)

Resin, sawdust and gas tar are mixed together and moulded into a firm substance.

CARR, C. J. *Improvements in operating hammers and stamps.* Dated Sept. 20, 1856. (No. 2274.)

The inventor beds a steam engine in the framework of the hammer, or on an independent foundation, and connects it by a rod and crank directly to the cam shaft. The hammer is raised by the helve or stem, without other fulcrum than the cams, and the force of the blow is regulated by the valves of the air cylinder or by friction. He also uses a series of metallic packing rings on the piston head, cut into segments, and placed with their joints overlapping each other.

WARD, J. N. *An improvement in the construction of self-priming fire-arms.* Dated Sept. 29, 1856. (No. 2275.)

This consists in feeding from a chamber

in the hammer head, at the cocking of the piece, that portion of Maynard's primer required for the discharge, and also in severing the protruding portion of the primer by the hammer and vent tube, as the hammer falls. There is a feed wheel, ratchet, and pawl, in combination with each other, and a coil chamber in the hammer head.

HICKSON, M. *Improvements in waterproofing certain woven fabrics.* Dated Sept. 29, 1856. (No. 2277.)

The best refined wax is dissolved and mixed with turpentine. "Fancy" goods are passed through the liquid, then over a fire on to a roller. "Plain" goods are in addition passed over and under cylinders, and on to a roller.

THOM, D., and G. A. PHILLIPS. *Certain improvements in apparatus used in the manufacture of soap.* Dated Sept. 29, 1856. (No. 2278.)

This consists of taps or outlets for running the soap out of the copper free from sediment. The interior surface of the bottom of the boiler is made convex, upon which the sediment will be deposited. A tap is placed in the bottom, and one in the side.

MORRISON, R. *Improvements in the construction of apparatus for lifting, lowering, hauling, and removing moveable articles by the direct action of either water, steam, or gaseous vapour.* Dated Sept. 29, 1856. (No. 2279.)

In these improvements spur-wheels, pinions, barrels, frames, and crane post are dispensed with, and the patentee substitutes therefor a piston fitted with a flexible piston rod working steam tight within the body of the crane post, which is made cylindrical for that purpose. Other improvements are comprised in the invention.

LORD, J. *Certain improvements in the process of separating or recovering animal wool or silk from cotton and woollen, or from cotton and silk or other mixed fabrics, whereby the animal wool or silk is rendered capable of being again employed, which said improvements are also applicable to wool in its unmanufactured state.* Dated Sept. 29, 1856. (No. 2280.)

This consists—1. In testing the acids employed by the use of alkali, instead of by the ordinary means. 2. In neutralizing the acid during the working of the process, without the immersion and the consequent second drying. The acid of the rags, &c., is neutralized by mixing soda-water with olive or other vegetable oil.

BOUSFIELD, G. T. *An improvement in the manufacture of artificial stone.* (A communication.) Dated Sept. 29, 1856. (No. 2282.)

The patentee takes of ordinary chalk from 80 to 85 parts, and of slaked lime from 15 to 20 parts by measure. These ingredients are pulverized and mixed with water to give the consistency for moulding. The paste is then moulded, and after coming from the moulds the blocks or tiles are dried in the open air.

RAMIE, C. W. *Improvements in constructing the permanent ways of railways.* Dated Sept. 29, 1856. (No. 2283.)

This consists—1. In using with wings or plates placed longitudinally and inclined upwards to form sleepers, chairs or brackets for securing the rails. 2. In cross sleepers of malleable iron, the sides inclining upwards, and connected to the rails, with or without chairs or brackets. 3. In wings or plates placed at intervals longitudinally, and alternated with cross sleepers of malleable iron, the sides of which incline upwards. 4. In jointing the end of the rails where they abut by means of a key inserted in their ends, and held in its position by side plates. The side plates described are retained in position by, and at the same time form beds for, the keys by which the rails are secured to the sleepers.

DILLON, T. A., and J. GRAY. *An improved means for making signals on railway trains between the guard and driver respectively, and between the passengers and guard and driver, and of giving notice to the guard and driver in case of the accidental severance of the parts of a train, which invention is applicable also to steam ships, factories, and other places where it may be requisite to communicate with distant points.* Dated Sept. 30, 1856. (No. 2285.)

This consists of an arrangement by which atmospheric action is brought into play by a mechanism of the nature of an air pump acting on an air tube or pipe.

GARD, W. G. *Improvements in bits for boring and sinking.* Dated Sept. 30, 1856. (No. 2288.)

These bits are formed in two separate and distinct parts. One part is a concave bit, with cross cutters attached to a hollow shaft, and communicating interiorly and directly therewith; the other part consists of an outer circular cutter having slots to prevent a vacuum, and is made of a greater inside diameter than the cutter.

BRUCE, D. *Making a concentrated animal manure.* Dated Sept. 20, 1856. (No. 2289.)

This has reference to the preparation of nitrogenous manures from animal matters, and has for its object so to fix the ammoniacal and other gases that they may be ready to act at once upon the crop without waiting for the decomposition of the compounds. The patentee claims—1. The described combination of carbonaceous and earthy matters prepared by means of roast-

ing and grinding in the manner set forth for the purpose specified. 2. The described manner of disorganizing the animal matters by heating them in closed vats at the required temperature, in combination with the method of disinfecting the same, and absorbing and fixing the ammoniacal gases by means of the above described carbonaceous powder.

FONTAINEMOREAU, P. A. L. DE. *An improved voltaic battery.* (A communication.) Dated Oct. 1, 1856. (No. 2290.)

This consists—1. In the employment of sulphate of potash to form the exciting solution or electrotype. 2. In placing the copper element so as to be in contact simultaneously with the air, the exciting solution, and the zinc element, the latter remaining immersed in the solution.

FLINT, G., T. WOOD, and E. WOOD. *An improved punching press or machine, adapted to the purposes of stamping, coining, slotting, and embossing, and for cutting metal and other substances.* Dated Oct. 1, 1856. (No. 2292.)

This consists—1. In so constructing a punching press or machine that the power is exerted from a cam or eccentric direct upon the punching tool, through wheel work, instead of through a lever or levers as commonly practised; and, 2. In so constructing the mechanism of the press as that it shall occupy considerably less space, and be cheaper than ordinary presses.

DAUGLISH, J. *An improved method of making bread.* Dated Oct. 1, 1856. (No. 2293.)

In making bread the dough has sometimes been made by mixing flour in a closed vessel with water charged with carbonic acid gas. Now this consists in compressing the air in the vessel in which the flour is contained before admitting the water charged with gas, so as to prevent the escape of gas before the process of kneading is completed.

HOLMAN, J. *Improvements in ships' rudders.* Dated Oct. 1, 1856. (No. 2294.)

In place of using the ordinary pintles and braces, the rudder post is made cylindrical, circular in section, and turns in straps connected to the stern post. The lower end of the rudder post steps into a bearing formed in a portion of the keel which projects beyond the post, and is strengthened by a metal strap.

BEGG, J. *Improvements in preparing and bleaching textile fabrics and materials.* Dated Oct. 1, 1856. (No. 2295.)

A series of vats or vessels are arranged in two parallel rows, which are in communication by means of pipes or ducts, fitted with stop-cocks. In the first, for example, of one row of these chambers is placed a suitable washing or preparing liquor, in the second a bleaching liquor, and so on throughout the series. The goods to be treated are placed in the bottom of a chamber in the opposite row, all the chambers being heated by steam. The valve governing the communication between the washing or preparing chamber and the goods chamber is opened, and a forcing apparatus situated on the pipe between the two chambers is then set at work. By the action of this the liquor is forced into the goods chamber, and right through the goods therein, and out at the other end through a pipe fitted with a valve loaded to any required pressure, and runs back again to the liquor chamber.

NAYLOR, H., and J. CRABTREE. *Improvements in and applicable to machines, commonly known as "warping mills."* Dated Oct. 1, 1856. (No. 2296.)

The object here is to make arrangements whereby the threads forming each division will pass on to the mill, parallel and side by side, or tape wise. This is accomplished by placing guides in front of the anti-friction pulleys, dividing the threads into beers, the surfaces of which guides are made to come against the threads of each division so as to place them in a position oblique to the plane in which the threads pass from the eyes of the heck.

NEWTON, A. V. *Certain improvements in sewing machinery.* (A communication.) Dated Oct. 1, 1856. (No. 2298.)

This consists in effecting the movements of the shuttle and feeding plate by devices having a positive motion, the objects being to impart such a motion to the shuttle that it shall move faster while going through the loop than in travelling back, and to vary the length of the stitch at pleasure by adjusting the length of the feed motion.

GARDISSAL, C. D. *Improvements in stoves and apparatus for heating or warming greenhouses, which may also be used for other warming purposes.* (A communication.) Dated Oct. 1, 1856. (No. 2300.)

This consists—1. In the utilisation and concentration in a single apparatus of the four elements of caloric resulting from the combustion of a combustible material, either by the heat of water, of steam, of air, or of smoke, the latter independently of the caloric radiating from the apparatus itself; &c., &c.

HARDON, E., and J. HENRY. *Improvements in looms for weaving, and in machinery for communicating motion to looms and other machines.* Dated Oct. 2, 1856. (No. 2305.)

These consist — 1. In supporting the heddle roller shaft of looms in bearings acted upon by springs, to allow the roller shaft to yield to the unequal action of the

mechanism for moving the heddles, and to compensate for irregularity in the motion. 2. In making the straps to which the heddles are suspended of elastic material, and in the application of springs to such straps. 3. In a mode of suspending the heddles when more than four heddles are employed. 4. In the application of the sun and planet motion for working the picking motion and the heddles. 5. In an arrangement of parts in combination with the vibrator for allowing the yarn to be drawn off the warp beam. 6. In working the drop boxes of looms in which two or more shuttles are employed, by an apparatus similar to that patented by the patentees, 24th June, 1856. 7. In regulating the motion of the taking-up roller by a vibrating lever, the action of which is governed by the increasing diameter of the cloth beam. 8. In communicating motion to looms, &c., in a certain way.

RENSHAW, J. *Certain improvements in machinery or apparatus for cutting or producing the pile of plain or figured velvets or other pile-cut goods or fabrics.* Dated Oct. 2, 1856. (No. 2307.)

This relates to a mode of cutting the loop or terry of velvets, &c., by an arrangement of rotary cutters, guides, and wires. The cutters revolve with a shaft upon which they are situated, by means of a key or feather upon the shaft fitting into a recess in the cutters, or *vice versâ*, so as to allow the cutters to move freely and loosely in a lateral direction upon such shaft, and being tight or bound only at the cutting point, or that in immediate contact with the loop to be cut.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

HOLLAND, J., and J. IRVING. *Improvements in the treatment of certain waste woollen yarns or threads, whereby the fibre or wool of which they are composed is rendered capable of being spun and manufactured.* Dated Sept. 27, 1856. (No. 2261.)

This consists in extracting the varnish, &c., from the fibres of wool which have been used in their original state as heated yarns, by the use of alkaline or ammoniacal solutions. This has also the effect of opening or untwisting the yarns, so that the drawing out of the fibres of the wool can be again performed, and the wool then be submitted to the processes of carding, &c.

THOM, D., and G. A. PHILLIPS. *An improvement in soap frames.* Dated Sept. 27, 1856. (No. 2262.)

This relates to means of fastening the ordinary metal soap frames, and consists in the application of "wedge cotters" to such purpose.

HAYES, J. M. *Improvements in percussion cap holders.* Dated Sept. 27, 1856. (No. 2268.)

These holders are formed of a compound of india rubber, sulphur, and in some cases fibrous matters, subjected to heat to render them elastic.

ORMEROD, J. *Improvements in machinery or apparatus for bleaching and washing or cleansing textile fabrics and materials, applicable also to the "soaping" of printed fabrics.* Dated Sept. 27, 1856. (No. 2271.)

The object here is to prevent the entangling of the goods, to effect which they are placed in separate portions upon pegs, rods, &c., adapted to the revolving chambers.

JACKSON, L. D., and H. MYERS. *An apparatus for the better working of breaks in stopping railway trains.* Dated Sept. 29, 1856. (No. 2272.)

A plate is attached to the main framework of the carriage, and an hydraulic cylinder and ram attached to a plate and guide rod, which is connected to the weigh shaft that works the present breaks.

LARNAUDÉS, J. F. V. *An anti-putrifactive and disinfectant.* Dated Sept. 29, 1856. (No. 2273.)

This consists in combining sulphate of zinc, sulphate of copper, and water. This mixture absorbs poisonous and deleterious gases.

BOYCOTT, R. *An improved air-door.* Dated Sept. 29, 1856. (No. 2276.)

These are self-closing doors, intended for underground workings. They are of an irregular square form, and wider at the bottom than at the top.

IVERS, S. *Certain improvements in looms for weaving.* Dated Sept. 30, 1856. (No. 2284.)

This is an improved picking motion. To the tappet-shaft, or other part of the loom, are attached two levers, acting alternately on levers projecting from side shafts. To each side shaft is attached a second lever, acting on a stud projecting from the picking-stick. By varying the distance of this stud from the fulcrum of the picking-stick, the strength of the pick can be regulated.

ROSS, R. C. *Improvements in paddle-wheels or propelling apparatus for ships or vessels.* Dated Sept. 30, 1856. (No. 2286.)

A cam arrangement is used to impart increased speed to the paddle float when it is most deeply immersed.

JAY, S., and G. SMITH. *A new material to be employed in the manufacture of bonnets, hoods, hats, or caps.* Dated Sept. 30, 1856. (No. 2287.)

The hair of the angola or angora is used for covering bonnets, hoods, hats, or caps.

Quentin, C. L. H. *Making a new kind of artificial millstones.* Dated Oct. 1, 1856. (No. 2291.)

The inventor takes earth or clay, reduces it to a pulpy state, then moulds it into the size and shape required, and bakes or burns it. To secure the necessary holes, furrows, or ridges in it, he places pieces of wood or other material in the soft mould, which, after it is baked or burnt, will be either consumed or easily removed, leaving the holes, &c.

Paterson, J. *Improvements in the manufacture of paper.* Dated Oct. 1, 1856. (No. 2297.)

The rags, after being assorted, are deposited in an acidulous and alkaline solution alternately, "or in one or both." The materials are then removed to the rubbing-machine, which consists of a receiver or holder with a base of metal or stone. This base is grooved or indented along or across its surface, and upon it rests a roller with grooves or indentations corresponding to those upon the bottom. The roller is then propelled backward and forward upon the materials. This renders the process of cutting them when dry in most cases unnecessary, while the dirt, &c., are effectually disengaged. The materials may be boiled in a boiler containing a mechanical agitator. After the pulping reduction the mass is deposited for a short time in an acidulous solution, when it is finally treated with the proper bleaching agent.

Salter, R. G. *A method of and apparatus for expediting the stamping or marking of letters, papers, labels, and documents, and improvements in and additions to stamping and marking instruments or apparatus, or in connection therewith.* Dated Oct. 1, 1856. (No. 2299.)

This invention consists in employing, in connection with the stamping or marking instrument, certain means or contrivances for raising the letter or other article after the marking has been performed, so as to separate it from the others, by excluding air from, or by producing a vacuum on the outer surface thereof, or by the employment of an adhesive agent. Also in apparatus employed for the purposes of the invention.

PROVISIONAL PROTECTIONS.

Dated April 16, 1857.

1086. Peter Armand Lecomte de Fontainemoreau, of Rue de l'Echiquier, Paris. An improved truck apparatus for moving and transporting stones and other heavy bodies. A communication.

Dated April 18, 1857.

1103. Charles Benjamin Normand, of Havre, France, engineer. Improvements in generating motive power by the employment of heated air, steam, and gases.

Dated April 25, 1857.

1164. Matthew Smith, of Heywood, Lancaster, manager. Certain improvements in looms for weaving.

1166. Stephen Tonks, Joseph Breeden, and William Breeden, all of Birmingham, manufacturers. A new or improved gas burner. A communication.

1168. Edmund Winder Otway, of West Bromwich, Stafford, engineer. Improved apparatus employed in descending and ascending pits or shafts, and raising minerals and other bodies therefrom.

1170. Thomas Mann, of Aldborough, near Boroughbridge, York, millwright. Improvements in horse powers.

1172. William Edward Newton, of Chancery-lane, civil engineer. The application of certain substances not hitherto used for food, as a source of nutrition and support to the respiratory organs of animals. A communication from H. W. Adams, of Brooklyn, U. S.

1174. William Cory, jun., of Gordon-place, Gordon-square. An improvement in the manufacture of coke.

1176. William Pickstone, of Radcliffe-bridge, near Manchester. An improvement in preparing or manufacturing dyeing matter peculiarly applicable to cotton and other vegetable fibres, and useful when dyeing and printing other fibres and fabrics. A communication.

1178. Augustus Piggott Oldershaw, of Doctors'-commons, London. proctor. An improvement in apparatus for skidding the wheels of carriages.

Dated April 28, 1857.

1190. Heinrich Hochstaetter, of Darmstadt. Improvements in the manufacture of matches.

1192. Wilson Ager, of Rohrsburg, United States. An improved mode of hulling and cleaning rice.

1194. Kenneth Leith Sutherland, of the Junior United Service Club, St. James's, barrister-at-law and paymaster of the Royal Navy, F.R.G.S., &c. An improved safety candle lantern.

1196. Dennis Grundy, of Tyldesley, Lancaster, boot maker. Improvements in the manufacture of boot, shoes, and clogs.

1198. John Ramsbottom, of Accrington, Lancaster, and John Bailey, of Salford, engineers. Improvements in regulating the flow and pressure of liquids and fluids.

Dated April 29, 1857.

1202. Charles Pascall, of Norwood, Surrey, engineer. Improvements in tile making machinery.

1204. Andrew Peddie How, of Mark-lane, London, engineer. An improved cork-holder for bottles and other vessels.

1206. Aimable Antoinette Revel-Busquet, of Paris. Certain improvements in artificial flowers.

1208. Joseph Bottomley, of Rochdale, Lancaster, spinner, and Christopher Hodson and William Fielden, of the same place, managers. Improvements in mules for spinning.

1210. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in apparatus for distilling, applicable also to the extraction of oils, coloring matters, and essences, and to the purification of gums. A communication from P. E. Lemettais and M. Bonière. of Rouen.

Dated April 30, 1857.

1212. Frederick Walton, of Haughton Dale Mills, near Manchester, card manufacturer. Improvements in the manufacture of wire cards for metallic brushes, and for carding fibrous substances, and in the machinery employed therein.

1214. Lucius Henry Spooner, of Munlochy, Ross, N. B., agricultural engineer and farmer. A new or improved manufacture of paper and paper pulp.

1216. Thomas Baldwin, of Bury, Lancaster, civil engineer. Improvements in indicators for registering pressure.

1218. Samuel Mortimer, of Halifax, York, mechanic. Improvements in "screw gill-boxes" used in the preparation of wool and other fibrous substances.

1220. Charles Cammell, of Sheffield, steel manufacturer. Improvements in the manufacture of axles or axle-trees for railway carriages and shafts for various purposes.

1222. Thomas Frederick Hale, of Bristol, founder. An improved tap or cock.

1226. James Anderson, of Glasgow, starch manufacturer. Improvements in the treatment, application, and use of maize or Indian corn.

Dated May 4, 1857.

1253. Thomas Beeby Moseley, of Upper Charlotte-street, Fitzroy-square. An improved pneumatic holder adapted for photographic and other purposes.

1255. William Edward Wiley, of Birmingham, pen and pencil manufacturer. Improvements in ever-pointed pencils.

1257. Spendlove Desborough, of Noble-street, London. An improvement in the manufacture of the sealed flaps of envelopes and letter paper.

1259. George Travis, of Mercaston, Derby. Improvements in apparatus used in the manufacture of cheese.

1261. Archibald Turner, of Leicester, elastic web manufacturer. Improvements in the manufacture of elastic fabrics, and for the application of such fabrics to the manufacture of boots and shoes.

1263. Bennett Johns Heywood, of Leicester-square, gentleman. An improved construction of self-closing valve, and means for rendering the same applicable for supplying or discharging air, water, and other fluids.

Dated May 5, 1857.

1265. John Talbot Pitman, of Gracechurch-street. An improvement in the construction of curry-combs. A communication.

1267. Thomas Keddy, of Birmingham, factor. New or improved machinery for cutting sugar and other substances.

1269. William Bond Paul, of Langport, Somerset, gentleman. Improvements in signalling upon railways.

1271. John Easterbrook and Robert Francis Drury, of Sheffield, engineers' tool manufacturers. Improvements in machinery or tools for drilling and boring.

1273. Levi Bissell, of New York. Improvements in trucks for locomotive engines.

Dated May 6, 1857.

1275. George Kennedy Geyelin, of Lothbury, London, civil engineer. Making oscillating spring laths for beds, couches, and other purposes.

1277. William Hood, of Edgbaston, Warwick, spirit merchant. An improved charcoal filter for rectifying and cleansing spirits, and which is also applicable for filtering water and other fluids.

1279. Arthur Kinder, of Worcester, coach manufacturer. Improvements in cutting irregular forms, and in the machinery or apparatus employed therein or connected therewith.

1281. Matthew Semple, of Stonehouse, Plymouth, gentleman. An improved pipe tube or stem.

Dated May 7, 1857.

1287. Ernst Ziegler, of Heilbronn, Wurtemburg. A substitute for animal charcoal, applicable also as a coloring matter.

1289. Charles William Ramié, of Camberwell. Improvements in the mode of attaching knobs to spindles.

1291. Duncan Morrison, of Bordesley-works, Birmingham. A new or improved manufacture of rollers or cylinders for printing fabrics.

1295. John Stenhouse, of Upper Barnsbury-street, Islington. Improvements in the manufacture of various kinds of glue or gelatine.

1297. George Brook Price, of Bedford, engineer. Improvements in apparatus for affixing stamps and labels to letters and documents.

1299. James Hedgely, of Westbourne-street, Eaton-square. Improvements in lamps for railway carriages.

Dated May 8, 1857.

1303. Charles Edward Darby, of Brymbo Iron Works, near Wrexham. Improvements in collecting the inflammable gases generated in blast furnaces.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1357. George Woodward Morse, of Louisiana, United States. An improved breech-loading fire-arm. Dated May 13, 1857.

1400. Charles Fréderic Vasserot, of Essex-street, Strand. A typographical numbering apparatus. A communication from A. Trouillet, of Paris. Dated May 19, 1857.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," May 26th, 1857.)

108. D. Cheetham. Improvements in apparatus applicable to steam and other boilers.

125. T. F. Henley. Improvements in the preparation or manufacture of certain beverages or liquors of the nature and character of home-made wines, and in the means of obtaining the same.

129. G. Bedson. Improvements in coating and insulating wire.

139. C. F. Vasserot. An improved paint. A communication.

158. J. Bird. Improvements in the manufacture of articles suitable to be used as window heads and sills, lintels, and other similar parts of buildings.

169. W. H. Barlow and H. Woodhouse. Improvements in the permanent way of railways.

197. R. Johnstone. Improvements in the manufacture of fire wood for lighting fires.

198. W. Roberts. Improvements in arranging ships and other similar pumps.

200. J. G. Marshall. Improvements in preparing flax, hemp, china grass, and other vegetable fibrous substances.

209. J. F. Powell. Improvements in reverberatory and other furnaces.

214. P. H. Sharkey. Improvements in the construction of scale beams or balances.

245. C. Whowell. Improvements in machinery for stretching, drying, and finishing woven fabrics.

263. G. Sampson, J. Sampson, and E. Ledger. Improvements in apparatus for effecting the folding or rigging of woven fabrics.

326. A. V. Newton. An improvement in machinery for polishing flat surfaces of glass and other substances. A communication.

424. W. Richardson. Improvements in the use of iron or any other metal, by itself, or in combination with other materials, for structural purposes.

477. T. W. Davenport and S. Cole. A new or improved method of manufacturing and ornamenting articles in papier maché and charcoal.

534. G. Barnett. Improvements in fasteners for parts of garments.

681. S. Faulkner. Certain improvements in machinery or apparatus for carding cotton and other fibrous substances.

763. J. Wilkes, T. Wilkes, and G. Wilkes. A new or improved manufacture of rollers or cylinders for printing fabrics.

1054. B. O'N. Stratford, Earl of Aldborough. Improvements in aërial navigation, and in the apparatus connected therewith, parts of which are applicable to locomotion generally.

1055. R. Knowles. Certain improvements in machinery or apparatus for winding yarn.

1062. R. Knowles. Certain improvements in power looms for weaving.

1118. W. Crighton and P. Foxcroft. Improvements in machinery or apparatus for preparing cotton, wool, and other fibrous substances to be spun.

1129. J. Higgin and J. Lightfoot. An improved compound, and improvements in the method of applying the same for the purpose of stiffening fibrous or textile materials, the same being applicable to the fixing of colouring matters or pigments.

1133. J. H. Johnson. Improvements in sewing machines. A communication.

1174. W. Cory, jun. An improvement in the manufacture of coke.

1177. J. Belshaw. Improvements in manufacturing knit fabrics.

1185. J. Macintosh. An improvement in the manufacture of air beds, cushions, and other like inflated and fluid-tight apparatus or bags.

1190. H. Hochstaetter. Improvements in the manufacture of matches.

1273. L. Bissell. Improvements in trucks for locomotive engines.

1277. W. Hood. An improved charcoal filter for rectifying and cleansing spirits, and which is also applicable for filtering water and other fluids.

1279. A. Kinder. Improvements in cutting irregular forms, and in the machinery or apparatus employed therein or connected therewith.

1295. J. Stenhouse. Improvements in the manufacture of various kinds of glue or gelatine.

1303. C. E. Darby. Improvements in collecting the inflammable gases generated in blast furnaces.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1115. Charles Barlow.
1130. John Crossley and William Crossley.
1149. Joseph Kuczynski.
1160. Thomas Ball.
1337. Joseph Oliver.

LIST OF SEALED PATENTS.

Sealed May 22, 1857.

2769. William Thomas Henley.
2789. John Orr.
2802. Francis North Clerk.
2810. William Woofe.
2812. Henry Hedgely.
2818. Joseph M. Saunders.
2819. Henry Turner Sourbuts.
2820. Henry Waller.
2824. Charles William Siemens.
2840. George Collier and James William Crossley.
2846. Noël Monnier.
2851. Richard Archibald Brooman.
2854. Louis Dominique Girard.
2862. James Mizen.
2869. Julien Denis.
2901. Stephen Randoll Smith.
2936. Thomas Wheatley and William Wheatley.
2944. William Player Miles.
3038. William Spence.
3097. Richard Archibald Brooman.
552. William Edward Newton.
667. Charles Lungley.
674. George Philcox.
690. James Garth Marshall.
716. John Shaw and William Manwaring.
717. William Edward Newton.
736. James Thomson.
853. George White.
860. George Gilmour.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subjects of Design.
Apr. 22	3972	A. Smith	Mauchline, Ayrshire	Ruler, scale, and pencil holder.
27	3973	G. Rainsford	Birmingham	Alarm apparatus.
29	3974	J. Morris and Sons	Astwood Bank, near Redditch.	Needle wrapper.
May 6	3975	J. Cooke	Colchester	Poultry pen.
7	3976	H. H. Armstrong	St. George-Street	Ships scuttles.
8	3977	P. Phillips	St. Martin's-lane	Sans égal portmanteau.
,,	3978	R. Macnab	Perth	Octagon laundry stove.
,,	3979	J. Bush	Derby	Lock.
12	3980	Price's Candle Co.	Vauxhall	Candle holder.
,,	3981	J. and W. Baker	Bristol	Drain pipe.
,,	3982	F. J. Hartley	Old-street-road	Fastener for umbrellas.
14	3983	P. Gadsby	Derby	Truss.
16	3984	H. Levy	Sheffield	Bottle corker.
,,	3985	G. Grainger	Worcester	Telegraph insulator.
,,	3986	H. Black and Co	Berner's-street	Elliptic spring.
19	3987	Fann and Lamb	Nottingham	Drawers or pantaloons.
20	3988	J. Young	Wolverhampton	Night latch.
,,	3989	J. Webb	Hawkedon, Suffolk	Adjustable plough.
,,	3990	Welch and Margetson	Cheapside	Oriental shirt collar.
22	3991	E. and W. Taylor	Birmingham	Sash fastener.
25	2992	J. W. Haythorn	Nottingham	Fruit gatherer.

PROVISIONAL REGISTRATIONS.

Apr. 23	881	J. Underwood	Birmingham	Pocket book.
25	882	M. Grouse	New Oxford-street	Watch preserver.
28	883	J. Davies	Euston-square	Lock spring for teeth.
May 4	884	F. J. Hartley	Old-street-road	Fasteners for umbrellas.
5	885	R. Ludlow	Birmingham	Canister.
,,	886	J. Webb	Hawkedon, Suffolk	Adjustable plough.
11	887	E. B. Doggett	Shepperton-street	Cartridge pouch.
,,	888	E. Robinson	Camberwell	Artizan chimney cowl.
12	889	J. F. Shaw	Kensington	Riding coat.
15	890	H. Woodrow	Granville-square	Waistcoat shirt.
18	891	A. Granger	High Holborn	Secret envelope.
23	892	S. Jones	High Holborn	Dell plate.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris: Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

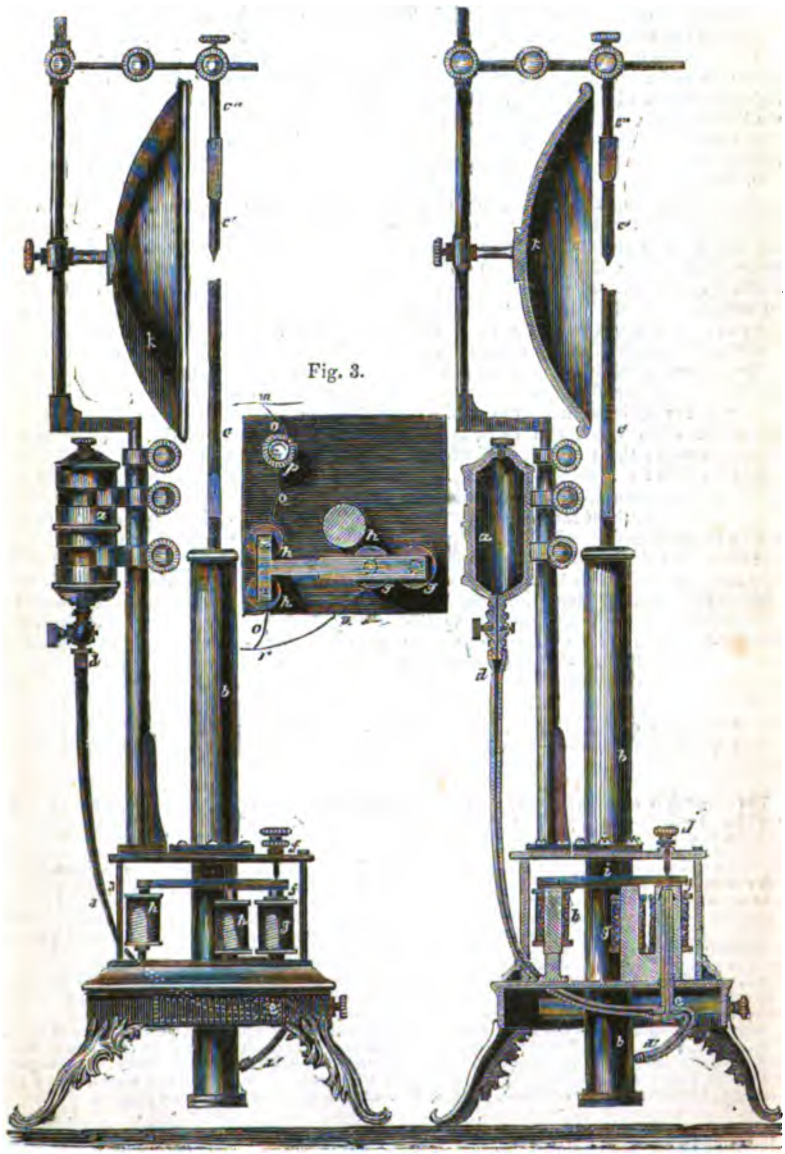
Mechanics' Magazine.

No. 1765.] SATURDAY, JUNE 6, 1857. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

AN IMPROVED ELECTRIC LAMP.

Fig. 1. Fig. 2.



AN IMPROVED ELECTRIC LAMP.

MESSRS. LACASSAGNE and THIERS, of Lyons, France, have recently been exhibiting at Paris and Lyons an electric light of unusual brilliancy, obtained by means of a lamp, which we propose to describe. We regret having to state, before giving our description, that while M. Thiers was last exhibiting the light, about three weeks since, at Lyons, his excellent colleague, M. Lacassagne, died of a disease of the chest with which he had been long afflicted.

The objects of their invention are, 1. To regulate and to keep constant the distance between the two electrodes of electric lights, whatever may be the rapidity of the combustion of the graphite of which they consist. 2. To obtain this constant separation of the electrodes by self-acting means, operating by the action of the current which produces the light, combined with the action of a spring, or with the action of a current derived from the light current. 3. To obviate the necessity of any daily regulating of the apparatus. These results are obtained by the passage of mercury from a reservoir into a receiving cylinder placed underneath. The tendency of the mercury to rise in this cylinder lifts with little friction a piston supporting the lower electrode, which approaches the upper electrode according as the mercury of the reservoir flows down into the cylinder. The action of the electrodes approaching each other is produced by means of a valve opening and closing the tube communicating from the reservoir to the cylinder. This tube passes through one of the soft iron arms of an electro-magnet, which receives its magnetic action from the current producing the light, and which shuts the valve by its action upon an armature of soft iron, which it presses against the valve. The armature which shuts the valve by the action of the current producing the light is attracted in an opposite direction by a spring, or by a second electro-magnet receiving magnetic action from the derived current, the intensity of which is determined by the resistance offered to it by a coil interposed for that purpose; consequently the passage of the mercury from the reservoir to the cylinder tends to establish itself under the action of the derived current, which opens the valve, and to be interrupted under the action of the principal current, which closes it; the resistance afforded to the derived current is invariable. The resistance afforded to the principal current increases by the widening of the distance or space between the two electrodes, and diminishes by their coming near to each other. If the distance between them increases, the principal current meeting a greater resistance diminishes in its intensity, which also diminishes the magnetic power of the electro-magnet due from the principal current which closed the valve; the intensity of the derived current (the resistance of which is invariable) increases in the same ratio, and tends also by its action on the second electro-magnet to open the valve. If the electrodes approach each other, the contrary effect is produced; the principal current increases by the diminution of resistance through the electrodes, while the derived current diminishes in the same proportion, and tending to close the valve to prevent the further passage of the mercury. It is then evident, that after having determined the resistance of the derived current by the length of the wire of the resisting bobbin or coil, there will be established between the two currents a kind of equilibrium, which will maintain a passage for the exact quantity of mercury that should necessarily flow from the reservoir to the electrode cylinder to lift and regulate the space between the electrodes.

The engravings on the preceding page represent an electric lamp constructed according to this invention. Fig. 1 shows the elevation of the photo-electric lamp; fig. 2 shows a vertical central section; and fig. 3, a plan of the self acting regulating part. *a* is a reservoir containing the mercury; *b* a receiving cylinder, receiving the mercury from the reservoir, *a*; in this receiving cylinder, *b*, a float is placed on the mercury, consisting of an iron disc supporting a stem, *x*, which carries the first electrode. *c c*, electrodes of graphite or carbon: the second is adjusted and fixed on the stem of the apparatus; its position may be varied as required by means of a screw *c*. The first electrode is moveable, and is connected to the rod *x* of the float. *d*, flexible tube, furnished with a stop-cock, leading the mercury from the reservoir, *a*, into the receiving cylinder, *b*, but it first passes through the regulating passage, *e*, which is a piece of iron, having two vertical passages, each connected by two horizontal parts with the two parts of flexible tube, *d d*; *f*, india-rubber valve covering the upper end of the two passages in the piece, *e*; *g*, bobbins or coils, traversed by the principal current; *h*, *h*, coils traversed by the derived current, producing the force antagonistic to the first bobbins or coils, *g*; *i*, soft iron armature; *j* thumb screw to limit the course of the armature, *i*; *k*, reflector; *m*, positive conductor to the upper electrode; *n*, negative conductor from the lower electrode to the generator of electricity, passing through the bobbins or coils, *g*; *o o*, conductors of the derived current in connection with the poles of the same battery or generator of electricity, passing through the resisting coil, *p*, antagonistic to the electro-magnet, *g*, connected with the conductor *n* at *r*. Instead of the second electro-magnet, *h*, a spring of a given strength, antagonistic to the magnet, *g g*, may be used, and will answer the same purpose.

AMERICAN SECTIONAL FLOATING DOCKS.

WITH reference to the interesting subject which we brought under the notice of our readers in No. 1763, viz., the formation of floating dry docks on the Thames, we now give the description of a floating dock in use at Philadelphia, in the United States, and also, we are informed, in California. We believe it to be open to the same objection as is Mr. Clark's dock, though not quite to the same extent; and we think we are right in saying that no ship of anything like the tonnage it is constructed to bear has yet been docked upon it.

The dock consists of nine rectangular tanks, each of which is 105 feet long, from 30 to 32 feet broad, and 11 feet deep. At each end of every tank there are three pumps with piston rods from 40 feet to 50 feet long, extending upwards to a platform 28 feet broad and 29 feet long, supported by a framework attached to the end of the tank. When the tanks are laid side by side, either with or without an interval between them, as the greater or less length of the ship may require, these platforms make a continuous stage, which will be about 8 feet above the surface of the water when the tanks are sunk to receive the ship, and about 40 feet when the ship is suspended. Two of these tanks have a high pressure engine on each of their platforms, making in all four engines of an aggregate power of sixty-four horses. These engines work a shaft running along on each line of platforms, to which all the piston rods of the pumps are attached. They are also employed either to lift or to force into the water a rectangular air vessel sliding up and down within each of the frames on which the platforms are erected. The use of this will be seen immediately. When a vessel is to be docked, the tanks are moored side by side, making up a length of from 282 feet to 330 feet, as may be required. They are then braced together, and the several parts of the shafting are connected with each other and with the engines. The tanks are allowed to fill and to sink until the blocks laid on their upper surfaces, are about 2 feet lower than the bottom of the keel of the ship to be docked. They are prevented from sinking lower than this by the air vessels spoken of, which are allowed to move up a line of cogs on the framing as the tanks descend until the required depth is reached, when the cogs are pauled. The frames then rest on the air vessels which, floating on the surface of the water with an immersion of between 5 feet and 6 feet, sustain the weight of the whole apparatus. After the vessel is hauled over the blocks the tanks are raised until the blocks touch the keel by connecting the cogged wheels by which the air vessels move up and down with the shafting; the engine then turns these round and, bringing a pressure on the air vessels, raises the tanks. Bilge blocks are then dragged under the bilge of the ship by men stationed on the platforms, and graduated shores are set against the side of the ship, from the side frames, to keep her upright before she is properly shored. The pumps are set to work, and the tanks, being gradually freed from water, rise; and, if the ship does not weigh more than 5,800 tons, lift her entirely out of the water. She is then shored from the tops of the tanks. If it should be required to raise or depress either end of one of the tanks before they are braced together, it may be done by connecting the gearing on one of the end air vessels with the shaft, and forcing it into the water, or by allowing it to rise up the cogs, as the case may be. The chief use of this gearing will, however, be to regulate the descent and ascent of the tanks. It will be observed that the dock is capable of division into two separate docks, each having a pair of engines. It is said to be capable of raising the heaviest ships in two hours. It is easily repaired, as one section may be raised by two others for that purpose. The shafting which conveys the power of the engines from one section to another runs into a hollow sliding shaft, and may be slid in or out as may be required by the proximity of the sections when united by the connecting beams. Between all the sections there is an universal joint in the shaft to provide for any deflection there may be in the line of shafting extending along and over the platforms.

The cost of the dock, with the engines complete, is said by Mr. Stuart,* Engineer-in-Chief of the United States Navy, to have been £76,000.

A shallow basin is used in connection with the dock, into which it may be floated. From this basin a sliding way leads to covered slips, up which the ship may be hauled by hydraulic machinery on a cradle prepared on the top of the tanks previous to her being docked.

* See "Naval Dry Docks of United States." (Weale.)

SURFACE CONDENSATION.

Surface condensation, which was first applied to steam engines by Watt, was made the subject of a paper read at the Glasgow Meeting of the Institution of Mechanical Engineers, by J. P. Joule, Esq., F.R.S., of Manchester, of which paper the following is an abstract. Watt in his first experiments employed pipes immersed in cold water as the means of condensing the steam and producing a vacuum. It was, however, speedily abandoned by this great man, who substituted for it the injection in a separate vessel, as employed almost universally at the present time. Surface condensation has, however, since the period of Watt, been repeatedly attempted with more or less success by various individuals, among whom may be especially mentioned Cartwright and Hall, the former of whom designed an engine which has been too little studied, though of admirable simplicity and combining all the essential apparatus of a perfect surface condenser; and the latter by his long-continued and laborious efforts nobly strove to introduce what he justly considered a great improvement. Without going farther into the claims of the many able men who have laboured unsuccessfully in this direction, it may be remarked generally that the system has not been so much in fault as the imperfect means employed to carry it out.

Having been for a long time impressed with this idea, the author embraced an opportunity for experiment which unexpectedly presented itself on the occasion of the erection of a small high-pressure engine for the joint investigation of Professor Thomson and himself on the thermal effects of fluids in motion.

The general arrangement of the cylinder and condensing apparatus in this engine is shown in fig. 1 of the annexed engravings. The engine has a cylinder, A, of 6 inches diameter and 6 inches length of stroke; it makes 180 revolutions per minute when going at full speed. Being fitted with the ordinary three-ported valve, the steam is cut off only after the piston has accomplished two-thirds of its stroke. The force pump, B, for feeding the boiler is single acting; the ram is 1½ inch diameter with 1¾ inch length of stroke, and is worked from an eccentric on a shaft which makes 1 revolution for every 3½ revolutions of the engine. The volume of steam passing through the cylinder compared with the volume of water propelled by the force pump, is therefore in the ratio of $6^2 \times 6 \times \frac{2}{3} \times 2 \times 3\frac{1}{2}$ to $(1\frac{1}{2})^2 \times 1\frac{3}{4}$, or as 256 to 1. When the steam is at a pressure of 15 lbs. above the atmosphere, rather less than one-third of the capacity of the pump is required in order to keep the boiler full, leaving the remaining two-thirds available for the purposes of an air pump.

Fig. 1.

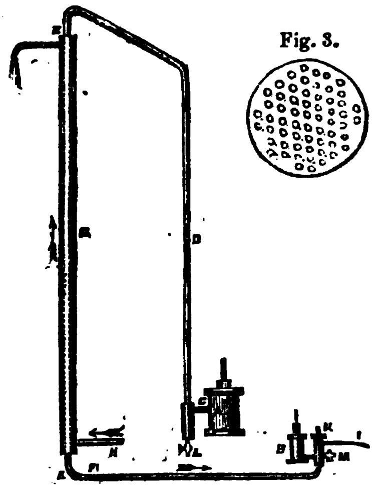


Fig. 3.

Although it seemed at first sight impracticable to work the engine with an air pump of so small a size, it was resolved to make trial of it, and accordingly the eduction pipe, C, was connected with the end of one of the legs, D, of an iron tube 1¼ inch diameter, bent into the form of a syphon of 10 feet high, the end of the other leg, E, being connected by means of a smaller pipe, F, with the feed pump, B. By this means the steam, after passing through the cylinder, is made to ascend to the height of 10 feet, and afterwards to descend through the iron pipe, E, 10 feet long and 1¼ inch diameter. The descending pipe, E, is surrounded with a current of water ascending upwards in an outer concentric pipe, G, of 4 inches diameter, the cold water being supplied from a pump through the pipe, H. The condensed water along with the air which enters by leakage is cleared out by the feed or air pump, B, the water being forced into the boiler through the feed pipe, I, while the air is allowed to escape from an orifice, K, contrived by loosening a screw in the cover of the pump.

On starting the engine, two stop cocks, L and M, one at the lowest part of the syphon leg, D, near the cylinder, and the other between the valves of the feed pump, are opened. The engine then works as a high-pressure engine until the boiler and cylinder are cleared of air and the condensing pipes, E and F, of water. This being effected the stop cocks, L and M, are closed, and after a few revolutions a vacuum begins to be formed, which increases until the

limit arising from leakage of air and the temperature of the interior of the condensing pipe is attained.

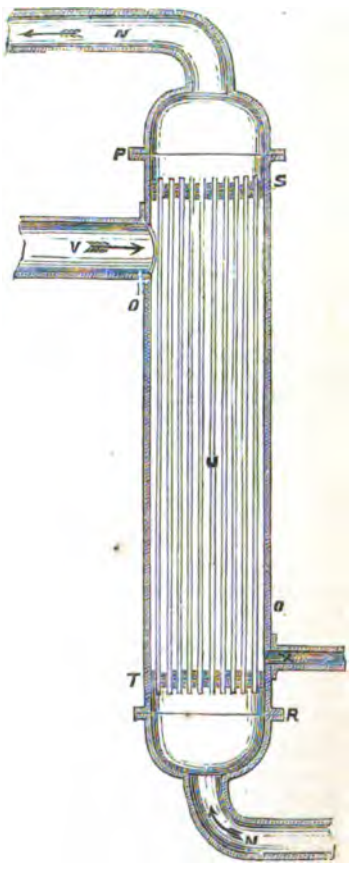
The very small size of the air pump would render the above arrangement quite abortive, if any considerable quantity of air leaked into the condenser. Nevertheless it was found that when the engine was working at one horse power including friction, that is, raising 33,000 lbs. one foot high per minute, a vacuum of 23 inches could be maintained, the barometer at the same time standing at 29 inches. This single experiment demonstrates, in the author's opinion, the practicability of the system of surface condensation as adopted in the present instance, and shows also that it must speedily supersede the method at present used. A vacuum of 23 inches may indeed be considered an extraordinary result, when the smallness of the air pump is considered, and when the leakage of air arising from a variety of junctions and stop cocks, and particularly from the stuffing box of the piston rod, is taken into account. Were these disadvantages obviated, as they might easily be, there is little doubt that the vacuum would equal that of most condensing engines. It is therefore concluded that one iron pipe 10 feet long and 1½ inch diameter is sufficient to effect adequate condensation for a one horse power engine, and that of course 100 such pipes would answer for a 100 horse power engine.

It will hardly be necessary to urge on practical engineers the immense importance of surface condensation, if once practically carried out. The disadvantages of the present system are well known.

Although the present experiments have not been sufficiently extended to determine with great precision the form and dimensions of a surface condenser for an engine of given power, the author thinks he can safely recommend the refrigerating surface above indicated per each horse-power. A sufficiently capacious pipe should convey the steam after passing through the cylinder to a chest placed 12 feet above the level of the base of the air pump. Another similar chest, with a pipe proceeding from it to the air pump, should be placed immediately under the above, and at about the level of the foot valve. Vertical pipes, about 10 feet long and 1½ or 2 inches diameter, in number equal to the horse-power at which the engine is estimated, and placed as near one another as convenient, should form a communication between the upper and lower chests. The condensing pipes should then be plunged into a cistern in which a current of water flows upwards. The air pump, if worked at the velocity of one stroke per second, ought to have a capacity of about 10 cubic inches for each horse-power.

An improved surface condenser, similar in principle to the above, has been proposed by Professor Thomson, and is shown in fig. 2. It consists of an enlargement of the cold water-pipe, N, in the form of a large pipe or chamber, O, connected to the pipe, N, by the joints P and R at the top and bottom. The chamber, O, is closed at the ends by two plates, S and T, perforated with a number of holes, as shown in fig. 3, to receive the condensing tubes, U, which are proposed to be fine copper tubes, as small as one-tenth of an inch inside diameter, fitting well but not tight in the holes in the tube plates. The joints are made water-tight by a disc of India-rubber, perforated in the same manner as

Fig. 2.



the tube plates, and placed below the lower plate, S, and above the upper plate, T. The exhaust steam enters the condenser at the

top by the pipe, V, and the cold water flows upwards through the pipe, N, and tubes, U. The condensed water is drawn off from the bottom by the pipe, X, leading to the air pump. By this plan there are no joints for leakage of external air into the vacuum except the ordinary joints for the connections of the exhaust pipe to the valve chest and condenser. The joints in the tube plates have water on the outside and the vacuum of the condenser on the inside, so that any leakage through them would simply give a little injection water, to which no supporter of the present system can object; the amount of leakage may, however, be made so slight as to be practically imperceptible. There is an important difference between the condenser now proposed and previous tubular condensers, in which the steam passes through a series of tubes surrounded by water, so that the deposit from the water takes place on the outside of the tubes, and cannot be cleared away; whereas in the proposed condenser the deposit takes place inside the tubes, and can be easily removed.

It has been proposed to employ air as the refrigerating agent for surface condensation. Could this be successfully realized, a most important practical result would be attained, for it would make the steam engine available in localities where a good supply of water cannot be met with. Experiments are about to be made by Professor Thomson and the author on the power of air as well as in elastic fluids as refrigerators, and it seems almost certain that the quantity of air which has the same capacity for heat as a certain quantity of water would effectually replace the latter as a refrigerator in a surface condenser. The volume of air would necessarily be great, but the labour of pumping would not, it is apprehended, present any serious disadvantage.

IRON AND STEEL.

At the meeting of the Society of Arts on the 27th of May, Mr. Christopher Binks (who has recently filed the specifications of two patents for "Improvements in the manufacture of iron and steel," and for "Improvements in converting iron into steel, and in giving a coating of steel to iron") read a paper "On some combinations and phenomena that occur among the elements engaged in the manufacture of iron, and in the conversion of iron into steel." The following is an abstract of his remarks:

The broad distinctions that exist in their mechanical or physical properties between steel on the one hand and malleable iron, or cast-iron, on the other, would seem to leave room for great doubt that these distinctions are due solely to the absence in the one, and to the presence in the other, of the element carbon, or to the merely minute differences in the relative proportions of that element that are found in steel and in cast-iron. Yet this is the received formula of the composition of steel; namely, that it consists solely of about 99 parts of pure iron combined with one part of carbon; and any other matters that, in extremely minute proportions, analysis may have, from time to time, or occasionally, detected in it, have been considered as foreign and accidental only, and in no way essential to, but rather interfering with, its true chemical composition and character. In this light, for example, have been looked upon the minute proportions of manganese found in some descriptions of steel, and also the nitrogen developed during analytical operations.

The same chemical doctrine of composition has always influenced, and still influences, the selection of materials to be used as re-agents in the formation of steel, or for the conversion of iron into steel. Hence, it is deemed needful only to bring heated iron in contact with carbon, or with some carbon compound, in order that the iron shall take up the one per cent. or thereabouts, considered as essential to steel; and hence, also, the selection of charcoal as this re-agent principally; and whenever other re-agents may have been taken and used as aids or substitutes, leather shavings, for example, this selection has always been made on the same general principle that it was the carbon alone that was to be absorbed by the metal. It will be seen, however, that either accident alone, or some theory of the quality of the carbon in these specially selected materials, has undesignedly led to the employment of the very elements along with the carbon that the production or the chemical composition of steel demands, and which other elements existing theory would either have altogether rejected, or certainly never have sought for. But let any one make a pilgrimage to Sheffield, and among the multifarious operations of the converting houses, and of the tool makers, he will speedily discover enough to shake his faith in the old doctrine, and facts enough upon which to reason in search of a new one.

He will perceive, for instance, that the old cementation process, the avowed object of which is to bring it into and keep in contact highly heated iron and carbon, in order simply to effect a combination between these two, is by no means of the uncomplicated character such simple conditions would imply. He will find, too, among the higher and thinking classes of that busy world, a growing conviction of

the insufficiency of the old theory—a conviction such as that which recently led Mr. Sanderson (one of the highest and most experienced of steel-makers) to state, in effect, that "the abstraction from cast metal, containing five per cent. of carbon, of four-fifths of that quantity, does not necessarily result in the conversion of that iron into steel, and that the abstraction from pig or cast iron of the entire quantity of the carbon proper to cast metal, does not result in the conversion of the cast into malleable iron."* In other words, in this statement of one who is ever surrounded with practical evidences, and habituated to the considerations they lead to, we have it given, as the result of such considerations, that the notion generally entertained is an erroneous one—viz., the notion that steel is merely iron combined with about one per cent. of carbon, and that malleable iron is merely iron without any carbon at all, or with less carbon than that requisite to form steel.

Before proceeding further, it is needful to define what steel really is physically, that is, what distinguishing properties it possesses, which, taken independently of its chemical composition, shall constitute an easy and incontrovertible test; or, in other words, shall enable us clearly to distinguish steel proper from iron compounds, or alloys of iron with other metals, or mixtures of iron with non-metallic elements, which in some respects resemble, but are not really steel.

Steel is distinguished from all other compounds by its capability of receiving different degrees of hardness, and a degree of hardness comparatively superior to any other metal; its elasticity under certain kinds of treatment; its capability of receiving a fine and a peculiar polish; its development of certain different colours under different degrees of heat; and by the permanency of the action upon it of induced magnetism. It is distinguished from pure iron by the complete absence in the latter of any one, or degrees of any one, of the properties just enumerated. But there are compounds of iron that exhibit some, but not the whole, of the special properties of steel. The outer coating of common cast-iron, when "chilled," or when the casting has been made in sand, is often as hard and as untouchable by the file as the best tempered steel itself. There exist also alloys of iron (as of iron with manganese and with other metals, such as those that were investigated by Stoddart and Faraday), that in the property of hardness alone are scarcely inferior to the finest steel. But in none of these special compounds are there associated the whole of the peculiar physical properties, the collection or series of which distinguish steel from any other substance. The peculiar effects of an admixture with steel, or with pure iron, of phosphorus, sulphur, silicium, &c., are pretty well understood; but it is the varieties of steel, the results of admixtures with steel proper of non-converted iron, in various proportions, that constitute the real difficulties of discrimination, and for these there exists no special test.

By means of a number of experiments with various re-agents the author found:—

1. That heated iron, exposed to the action of pure carbon, and kept out of reach of contact with any other element, is not converted into steel. A small rod of malleable iron packed in boxwood charcoal in a closed porcelain tube, and kept at a full red heat for 12 hours, did not, after being tempered, show a hard steel surface, nor did it exhibit, under high and different degrees of heat, the play of colours peculiar to real steel. It still remained malleable iron.

2. But that, when atmospheric air is admitted to such an arrangement in such quantity only as still to keep the carbon in excess, then, in the first instance, the surface of the iron, and, finally (if the time of contact be long enough), the whole of the iron, is converted into steel.

3. That the application to the iron of gaseous nitrogen does not produce steel.

4. That neither does the application of carbonic oxide give steel.

5. That the application to the iron of a hydro-carbon (as when olefiant gas is passed through the tube, or when the red-hot rod is dipped into oil containing no nitrogen) does not produce steel.

6. But that the application of olefiant gas mixed with ammonia, or the application of gaseous cyanogen, produces steel, as does also the dipping of the hot metal into a nitrogenised oil or fat.

7. That the application of ferrocyanide of potassium (as has been so long known) gives steel.

8. That, equally with the ferrocyanide, does the application of the simple cyanide of potassium result in the production of steel; therefore, it is not to the iron contained in the ferrocyanide that the steel-making property of the latter salt is due.

9. That potash applied to the hot iron, or keeping the hot iron in contact with the vapour of potassium, does not yield steel.

10. That with iron of the kind that has so far been referred to and used (that is, commercially pure wrought iron, containing no material proportion of carbon, the application to it of ammonia, or of nitrate of ammonia, fails to produce steel.

11. But that the application of ammonia, or its muriate, to iron containing a con-

* See *Mech. Mag.*, vol. lxv., No. 1725, p. 204, col. 2.

siderable proportion of carbon, results in its conversion into steel.*

By a consideration of these preliminary and merely guiding trials, besides the other deductions they lead to, as already stated, there is made apparent one significant fact, namely, the invariable co-operation, so far as these trials extend, of both nitrogen and carbon in the production of steel; but these co-operate in some manner yet to be defined and ascertained. It still remains to be determined if this co-operation of nitrogen be a *necessity* in steel-making; or if the apparent invariableness of its presence and co-operation will, on a more extended examination, be borne out by the evidence of every other process; and if so, is it that the nitrogen, conjointly with the carbon, forms some combination with the iron and remains there, or that the nitrogen acts merely as an intermediate agent, and that it still remains a chemical agent, and that steel is merely iron combined with carbon only, though nitrogen plays an essential part in effecting that combination? But whatsoever may be the functions in steel-making that are exercised by nitrogen, if its office be functional at all, and its presence be not a mere coincidence in every case—the fact of its invariable co-existence with carbon, whenever steel is produced, is incontrovertible.

A review of the above facts and phenomena is provokingly suggestive that the existing theory of the composition of steel is a wrong one. And the first suspicion is that this nitrogen element does actually enter into and exist in that compound, and that not to errors in analysis, but to misconceptions when nitrogen was found in steel, or to the influence of pre-conceived notions, is to be attributed the fact of this element exercising any kind of agency in steel-making having hitherto been overlooked; or that its presence, when found, has either been disputed or attempted to be accounted for on other grounds than that of chemical combination.

The attention of the chemical world was first prominently called to the fact of the existence of nitrogen in iron and steel by Professor Schafhäutl, a translation of whose paper appears in the *Philosophical Magazine* for 1840. But neither Schafhäutl nor Marchand speculated as to the meaning or the effect of the presence of the nitrogen in steel; wherever in the exercise of their manipulatory skill it is found, the fact is left without comment or consideration.

(*To be concluded in our next.*)

* These results tabulated, and the composition of the re-agents expressed in formulæ, will better exhibit the inevitable deductions to which they lead.

(1). Fe+C (in excess), every other element excluded	Leaves iron.
(2). Fe+C (in excess)+(atmospheric air)	Gives steel.
(3). Fe+N (gaseous nitrogen)	Leaves iron.
(4). Fe+C O (gaseous carbonic oxide)............................	Leaves iron.
(5). Fe+H_4 C_4 (olefiant gas)	Leaves iron.
(6). Fe+H_4 C_4 (in excess)+N H_3 (ammonia)	Gives steel.
(7). Fe+N C_2 (cyanogen)	Gives steel.
(8). Fe+K_2, Fe Cy_3 (ferrocyanide of potassium)	Gives steel.
(9). Fe+K, Cy (cyanide of potassium)	Gives steel.
(10). Fe+K O (potash)	Leaves iron.
(11). Fe+K (potassium)	Leaves iron.
(12). Fe+N H_3 (ammonia)	Leaves iron.
(13). Fe+N H_3 Cl (sal ammoniac)...	Leaves iron.
(14). $\frac{Fe+C}{95\quad 5}$+N H_3 (ammonia).........	Gives steel.
(15). $\frac{Fe+C}{95\quad 5}$+N H_3 (sal ammoniac)...	Gives steel.

ALLAN'S ELECTRO-MAGNETIC ENGINES AND ELECTRIC TELEGRAPHS.

In a recent article, our excellent contemporary, *Cosmos* (of Paris), after a somewhat inaccurate description of Mr. Allan's electro-magnetic engines, says:—"The Editor of the *Mechanics' Magazine* states that he has seen these engines work with the greatest success; they present the least imperfect, or rather, according to him, the most excellent solution yet effected of the great problem of the employment of electricity as a motive power. In his Magazine of the 25th April he adds, that the model exhibited at Paris was put in operation at the Conservatoire des Arts et Métiers before it was taken to the Tuileries, that it was submitted to a Commission presided over by General Morin, and that the report of this Commission was sufficiently favourable to decide the application of the invention upon a large scale, the success of which could not be doubted. But we still doubt, notwithstanding these confident assertions, that Mr. Allan has made a single step in advance of our countryman, M. Froment. Besides, all who are competent to give an opinion on the subject are convinced that electro-magnetism can never replace steam as a motor, unless some new and cheap source of electricity be discovered. To employ ordinary batteries in the production of force would be about as economical as to burn zinc as fuel instead of coal in the furnaces of our steam boilers; it is clear that zinc is too costly for this sort of consumption."

To be misunderstood is a misfortune which happens to the great and to the small. We are, therefore, neither greatly surprised nor much annoyed when we find that our statements have not received at the hands of others the precise interpretation which we wish them to bear. But still we feel some regret when what we write is not read as was intended; and we especially

regret a misapprehension of our meaning on the part of the Editor of an influential continental journal. The above quotation shows, however, that we have certainly been mis-read by our French contemporary, and we are anxious to correct his statements, which have resulted apparently from a too hasty perusal of our former remarks.

Let it be understood, then, 1. That we did *not* state that the report of General Morin's Commission was sufficiently favourable to decide the application of the invention upon a large scale. We most explicitly said we were "not in a position to speak definitely of the result of the investigation," but "had reason to anticipate that the principle of the engines was about to be tested upon a large scale." 2. We never intimated that Mr. Allan was prepared at once to replace the steam engine for general purposes by his electro-magnetic engines, for we by no means believe him to be. What we really consider him to have accomplished is, the construction of electro-magnetic engines of unequalled merit, and of such a character that for many manufacturing purposes they may be employed with advantage, and that, too, in cases where steam is quite inapplicable. This, we submit, he has succeeded in effecting, and this is what we give him unmeasured credit for. We know something of M. Froment's machines, but we are not aware that he has yet invented one that can be fairly pronounced equal to Mr. Allan's. We may add that, from our knowledge of the latter gentleman's operations, we expect still further improvements from his hands before long. As to the comparison drawn by *Cosmos* between the use of zinc in galvanic batteries, and of the use of it in furnaces, we will only state here, that notwithstanding much recent quasi-scientific speaking and writing upon the subject, the comparison is altogether inappropriate, and can only lead to absurd conclusions. This we shall probably show before long.

Our contemporary also speaks of Mr. Allan's improvements in electric telegraphs as follows:—"Mr. Allan's improvements in the electric telegraph are of two kinds. In the first place he proposes a new submarine conductor or cable, having a metallic core formed of nineteen threads of iron wire twisted into a strand of about 1 inch in diameter; this core is first covered with an envelope of India rubber, and the whole coated with a mixture of tar and sand. The cost of the metallic portion of this cable would not exceed 1,000 francs per kilometre; its weight per kilometre would not be more than *quatre quintaux;* its strength would be at least equal to that of the cables in actual use, and, though the conducting power of iron is to that of copper as one to five, the increased surface of the conductor will amply compensate for this defect in its material. There is no reason why copper wire, if required, should not be associated with the iron in the manufacture of the metallic core, and thus unite the strength of the iron with the conducting qualities of the copper. Lastly, Mr. Allan substitutes for the electric current, as ordinarily employed for telegraphic purposes, a current of increased tension derived from an induction coil like that of Ruhmkorff. We are unable to detect any new principle in these alleged improvements, and we ascribe it to the enthusiasm of the English journalist, when he naïvely tells us that Mr. Allan has solved the problem of the submarine telegraph, as Columbus solved the problem of making the egg stand on its smaller end, that is, in a way delightful at once for its simplicity and efficacy."

Here again our contemporary is unfair to us. The egg-illustration was not ours, as he would lead his readers to think, by alluding to the "English Journalist" after having referred to the Editor of the *Mechanics' Magazine* only. The allusion to the egg was made by the *Times* in an article which we quoted from that Journal.

But after all it was not a particularly inapt allusion. For Mr. Allan's telegraphic inventions are not, it should be remembered, productions of the last few weeks, as some seem to suppose. It is four or five years since we drew the attention of our readers to their essential features, and pointed out their merits. In August, 1853, we described the principle upon which his improved rope was constructed, as that of "having an incompressible and inextensible core, by which arrangement all rending or crushing forces are prevented from acting upon the insulated wires, and the security of the rope is made very great," adding, that "this principle is the reverse of that on which the Dover and Calais rope is constructed, where the soft insulating medium forms the principal part of the core of the rope; and it is apparent that in this arrangement the conductors are very much more exposed to fracture than in the former."

Again, in November, 1855, after the failures in laying the cables in the Gulf of St. Lawrence and in the Mediterranean Sea, we recalled attention to Mr. Allan's ropes. And in December of the same year Mr. Allan himself addressed to us a letter upon the subject, in which he said, "I have stood alone for upwards of two years in trying to introduce the principle of light submarine ropes in lieu of the heavy, expensive, and self-destructive," and referred

to the date of his patent in confirmation of his statement. In the City Article of the *Times*, of 28th October, 1853, similar facts were put forward.

From all this, then, it plainly appears that at a very early date, and before experience had been acquired in the laying of telegraph ropes, Mr. Allan proposed what will soon be adopted as the best of all submarine cables, and therefore deserves the credit that is due to a person who possesses genius enough to foresee what others require experience to demonstrate to them. If it be enthusiasm to say thus much in Mr. Allan's favour, then are we enthusiastic. We are not, however, very prone, we think, to abandon ourselves to enthusiastic admiration of new inventions of doubtful merit. Admiration is not our forte. If we shine in any occupation, it is certainly not in that of the "enthusiastic admirer." We believe, however, that we are sufficiently catholic in our sympathies to rejoice at the success of any invention which does not proceed from an enemy, and therefore we should be glad to hear still more of the successful efforts of our allies across the Channel. But we are especially pleased with the success of a countryman of our own who has devoted much time, wealth, and labour to a scientific aim.

VISCOUNT CARLINGFORD'S AERIAL MACHINE.

Viscount Carlingford, of Swift's Heath, Kilkenny, has patented an aërial machine, with which he anticipates obtaining great results. We learn from Lord Carlingford that the improved machine is likely to be experimented with shortly at the Crystal Palace, Sydenham. The following is an extract from the specification which is about to be filed, and which was written by the patentee himself. "The aërial chariot in form is something of the shape of a boat, extremely light, with one wheel in front and two behind, having two wings slightly concave fixed to its sides, and sustained by laths of a half hollow form pressing against them, and communicating their pressure through the body of the chariot from one wing to the other, and supported by cords whose force, acting on two hoops nearly of an oval shape, holds the wings firmly in their position, using a force that cannot be less than ten tons, on the principle of corded musical instruments. The aërial chariot is provided with a tail that can be raised or lowered at pleasure, and which serves for giving an elevating or declining position, and worked by a cord that communicates into the interior of the chariot which is drawn forward by an aërial screw of the perfect form of the screw propeller discovered by the same inventor, and presented by him to Government the 16th of June, 1854, and which screws into the air at an elevation of 45°, similar to the bird's wing, and is turned by means of a winch acting on three multiplying wheels. The wings of the chariot are covered with a net-work, of a lengthened square shape, which produces the effect of birds' feathers when the chariot floats on the air, covered with silk, at which time may be seen its impression with the points forwards, and the same backwards, by which no pocket, as it were, can be formed by the pressure of the silk on the air. The upper part is finished in the same manner, and both sides of the wings are covered with varnish. The body of the chariot, the wings, and all of it in general are made of very light wood, with few exceptions, weighing in all from four to six stones, and covering a space from 25 to 30 feet square, or according to the weight it is intended to carry. It can also be constructed, and considerably increased in size, to carry very superior weights, yet the wings will not require to be increased in the same proportion." Lord Carlingford adds, in a foot note, "An aërial screw, of only five inches long, can give a pull greater than a ten-pound weight suspended to a cord, and drawing through a pulley, and as it will only take such a small force to maintain the flight of the aërial chariot, that what we look upon as fabulous may hereafter come to pass, and that, like the chariot of Jupiter, we may yet behold two eagles trained to draw the Aërial Chariot!"

MISCELLANEOUS INTELLIGENCE.

New Electric Light.—In a letter to the Editor of the Paris *Cosmos*, Professor Tyndall says, "Mr. Faraday, I am happy to say, is quite well; he has made known to me a new application of magneto-electricity—the electricity generated by electro-magnetic machines. It consists in the production of an electric light which is truly splendid, and which can be immediately employed for illuminating lighthouses. I am this instant about to start to assist in some experiments on this subject, which are to be made this evening, at Blackwall, near London."

A New Italian Observatory.—M. Porro, the Italian astronomer, having invented a new astronomical telescope of great power; it has been considered desirable that this instrument should be retained per-

manently in Italy, the sky of which, from its excessive clearness, affords greater facilities than most others for astronomical observations. A number of Italian gentlemen have accordingly determined to found, at some well-selected spot in that country, an observatory of the first order, which shall have the gigantic instrument of M. Porro as a nucleus, and be endowed with the necessary funds in perpetuity. The undertaking is, we are informed, progressing favorably, and its success is already placed beyond doubt.

Baron Humboldt. — Before quitting Berlin, His Imperial Highness Prince Napoleon bestowed, in the name of the Emperor, the decoration of a Grand Officer of the Legion of Honour upon Baron Humboldt. This new homage rendered to the illustrious and venerable *savant*, whose great works are known and appreciated as well in France as in Germany, has given the most lively satisfaction at Berlin.—*Cosmos.*

The Manufacture of Iron.—Allusion has been made in the *Times* to an invention of the Abbé Pauvert's, for improving the make of iron. In a letter on the subject, Mr. J. H. Browne, writing from the Reform Club, says: "The Abbé Pauvert, after long and laborious researches into the nature of iron and its varied combinations with carbon, has found that in order to obtain different qualities of steel from iron, regard must be had, not only to the purity of the iron and the quantity of carbon combined with it, but also to the mode in which the carbon existing in the iron enters into combination with it, and to the manner in which crystallization takes place. In order, therefore, to obtain steel of superior quality from all kinds of iron manufactured by means of coke, it was indispensable to ascertain the manner of purifying the iron, of regulating to a certainty its combination with the carbon and its crystallization. That the Abbé Pauvert has arrived at these results, was fully attested by his experiments at the Royal Dockyard, Woolwich. ...... The manufacture of the steel does not require the slightest change in the actual arrangements of the smelting and cementing furnaces, crucibles, or other apparatus. The conversion of the metal is simply effected by chemical ingredients and electric agency."

South Kensington Museum, under the direction of the Committee of Council on Education. President, the Right Hon. the Earl Granville. Vice-President, the Right Hon. W. Cowper, M.P. The following rules have been sanctioned for the admission to this museum, which will be opened to the public in June. 1. The collections of objects relating to education, architecture, and trade, of pictures, sculpture, ornamental art, and models of patented inventions, will be open to the public daily, from 10 till 4 in the day-time, and from 7 to 10 in the evening on Mondays and Thursdays, except during the appointed vacations. 2. On Mondays, Tuesdays, and Saturdays, and daily during the Easter and Christmas weeks, the public will be admitted free; but on these days, books, examples, models, casts, &c., cannot be removed for study. 3. On Wednesdays, Thursdays, and Fridays, the public will be admitted on payment of 6d. each person. This sum during the day-time will enable any person to consult any books, diagrams, &c., in the collections of education, and to copy any article in the collections of art, except modern paintings, for which special permission in writing must be obtained. In the evening, works cannot be removed.. An annual ticket of admission to all the collections, morning and evening, may be obtained for 10s. 4. Sticks, umbrellas, parcels, &c., must be left at the doors. 5. Except the fees above mentioned, no fee or gratuity is to be received by any officer of the department from any person. 6. The Library of Art is open every day, from 11 A.M., to 9 P.M., except Saturday, when it is closed at 4 P.M., and the usual vacations. 7. All registered students of the Central School of Art have free admission to the library. Occasional students are admitted upon payment of 6d., which will entitle them to entrance for six days from the day of the payment of the fee, inclusive: a monthly ticket may be obtained for 1s. 6d., and an annual admission for 10s. 8. Refreshment and waiting-rooms in a special building have been erected, and presented to the public, by the Commissioners for the Exhibition of 1851. They are under the management of Mr. G. Withers. 9. The General Omnibus Company have arrangements in progress to convey passengers to and from the Museum and all parts of the metropolis every half hour at least.

Wonderful Discoveries. — At the meeting of the French Academy of Sciences, on the 25th of May, M. Elie de Beaumont announced the following novelties; viz., a method of reproducing animal life; a complete solution of the problem of aërial navigation; a project for a universal language; and the discovery of the cause, nature, and an infallible cure for cholera!

Cartridge Paper and Angular Grooved Rifles.—Sir,—I find that the newly discovered means of making paper *tough*, as described at page 445 of your Magazine for May 9, is well adapted for my seamless cartridges. The so prepared paper is sufficiently damp-proof for all service purposes.

Mr. Squires, gunmaker, Whitechapel, has shown me a pistol barrel rifled with four angular grooves. The mouth of the pistol is square or quadrangular, and a piece of lead cast in the barrel, and cut transversely, presents a quadrangular face. Mr. Manton, of Dover-street, showed me a similar pistol barrel. They are both evidently very old, having been made when the flint-lock was in general use, more than twenty-five years ago. I stated through the columns of the *Mechanics' Magazine'* that I used plumbers' solder for casting my elongated rifle shot and shells to fit into the grooves of the rifle, as that composition, from its hardness, would not *strip* or slip out of the grooves when heavy charges are used. J. NORTON.

June 11, 1857.

THE CONSERVATION OF FORCE.

To the Editor of the Mechanics' Magazine.

SIR,—I hasten to disclaim most strenuously the construction put upon my last letter, that it is in any the slightest extent whatever, "an authorized defence of Faraday as well as of myself." The merit or demerit of my communications belongs to myself alone. In respect to what was personal to Professor Faraday, the letter contained merely an *amende* for some misconceptions of my own, together with an announcement of the favourable result of a mathematical investigation, based on his conceptions of "lines of force;" and as to the general subject of "the conservation of force," surely an admirer of our great philosopher may be permitted to advocate his views, without being supposed to throw on him the shadow of responsibility, either as to matter, manner, or suggestion in such a defence. Besides, it is well known, that he is very averse to forward his views in any other way than by the force of reason contained in them, and what he would not do directly, you will readily believe he would refrain to do indirectly.

I wish also to disclaim the construction you put upon this statement of mine, "wherever phenomena exist of whatever kind, there force is present to produce them, whether it can be mathematically detected or not." You say it implies, that "where there is motion there must be force to maintain it," alluding of course, though it is not so stated, to unaccelerated motion. You are aware, if only from my preceding letter, that I do not really hold such an absurd opinion; and you must not say that through carelessness it is implied, for I did not append the word "maintain," or any equivalent to it to the word "produce." If force does not produce, that is originate, all phenomena, motion of every kind included, I should like to know what does. In none of my communications will the mediæval notion of force here imputed to me be found. Only last year in your pages I told a correspondent, in reference to this very point, that in his ardour for progressive knowledge he was for advancing backwards.

Your criticism, "that distance alone is no proper measure of space," is of course correct; but what I said was this, "that distance is space itself, in its relation to two bodies," and this is rigorously exact, even without the assumption that they are at rest. To give it the appearance of inexactness, you introduce the idea of the motion of the two bodies, as describing orbits round one another, and thus affording in area an additional relation to that of distance; but this new relation of area is simply simultaneous with the other, and is not in common with it a relation of space to two bodies, but is the relation of space to their motions, and may therefore be predicated in connection with *one* body. We cannot obtain the relation of area from two bodies alone, but must either have a third body, or an additional idea in motion; whence on second thoughts you *will* be able to see, "how space in its relation to two bodies *can* be simply distance."

With respect to what you say of the *vis inertiæ* "not having been allowed by philosophers for two centuries," permit me to remark, that I am not aware Sir I. Newton, up to the date of his death, which is far within that period, ever recalled his opinions on the existence of what, designating it by the terms *vis insita* and *vis inertiæ*, he says is "the innate force of matter." My views on this point will find ample shelter under his name. They were only mathematicians such as, and including, Euler, who ever objected to the *vis* of *inertia*.

It is something new to me to find, that "it never entered into the head of a mathematician" in the enunciation of the law of gravity, to understand it physically as well as mathematically, and to assign any influence to the distance purely as distance. Are they, then, all non-attractionists? It was only as physicists that Faraday objected to their views. If "the way in which the influence of distance is felt," is not a moot point, why an adverse criticism on his lecture? — what is there in dispute? unless indeed—if it is possible any one could conceive such a thing—that Faraday was supposed to have objected to the law, in its mathematical sense. But are mathematicians so abstemious, even in your own pages? Did not your correspondent, "A Mechanic," advert to "the difficulty of conceiving *how* the *attraction* between two

bodies can grow so fast, *simply* in consequence of their *approach*," observing however that similar mysteries would attach to any other view of the subject? It was only to such an interpretation of the law in a physical sense, wherein the variation is assigned to distance as a cause, or as a property of attraction, that Faraday demurred, as being inconsistent with the conservation of force; and if this be given up, in what has he offended?—into what error has he fallen?

As to my assertion of the vagueness and indefiniteness of the generic word "force," can it for a moment admit of dispute, notwithstanding "A Mechanic" has so laboured the point, that it is much more vague and indefinite conceived as a cause, than when contemplated as an effect in measurable terms, such as it is in momentum and other species or forms of force. Vagueness is comparative, and though we *can* define a generic word, which of course I did not deny, it is necessarily more vaguely apprehended by the mind than when "the common characteristic of the family of facts" is further particularized in the species, especially if by measure.

I cannot enter on the subject of the measures of force—their number, character, and relations—unless you will grant me room for a paper on it. But it is through a prevailing obscurity on this very point, causing mathematicians to adopt one measure when they should have taken another, that their errors on practical points have mostly arisen. It is now approaching thirty years since I drew attention in your pages to the enormous power that would have to be provided in locomotive engines, to encounter at high velocities the resistance of the air, &c. Acting on the principle that the power would be proportional to the cube of the velocity, I estimated that engines of between three and four hundred horse power would be required. Well, the clever mathematical paper that had appeared in the *Scotsman*, and which had given such an impetus to railway enterprise, had taken no account of either of these important points; and so *my* notice of them was ridiculed as the Chevertonian theory, and that, too, by an undoubtedly able mathematical correspondent, as his numerous valuable communications to your pages proved; and yet I have lived to see locomotives constructed of more than double that power, and the rule of the cube of the velocity universally recognised. Now, the errors of these able mathematicians arose from hazy conceptions as to the measures of force, and as to what was suitable in the case. Mathematicians know better now; but there was a day when they could see nothing but momentum in a problem, however practical its character. Depend upon it, Sir, nothing but good can arise from pointing out mistakes in any class of men; and it often happens, in every department of knowledge, that the comparatively uninitiated will see them, and suggest improvements in cases where adepts are professionally blind. It was to our engineers, with their notions of work and duty—the words themselves being witnesses—that we have been indebted for the improved mathematical treatment of practical subjects, where the suitable cases occur.

My more especial consideration of the "conservation of force," in defence of Faraday's views of it, and as distinct from its mathematical aspect, I must reserve for a separate communication; and then I may be permitted to take leave of the subject.

I am, Sir, yours, &c.,

BENJN. CHEVERTON.

[It will be unnecessary for us to offer any lengthened remarks upon the above letter. The supposition that Mr. Cheverton's preceding letter was, "to some extent," an authorized defence of Faraday, was not our own only, but was shared in by many of our readers and friends. The matter is not, however, very important.

We submit that the conclusion drawn by us from Mr. Cheverton's remark respecting the presence of force wherever phenomena exist was a just one. The continuous motion of a body moving uniformly is a phenomenon, and wherever it exists, there force is present also, according to Mr. Cheverton's statement. Mr. Cheverton's present explanation would seem to imply that continuous uniform motion is not a phenomenon at all! Our criticism upon the point was manifestly just, and it is useless for Mr. Cheverton now to allege that it was unnecessary.

We cannot allow our share in this discussion to be prolonged unnecessarily; and therefore we will merely state, in opposition to Mr. Cheverton's allegation respecting Newton, that the whole tenor of Newton's doctrines of force was adverse to the views of our correspondent on the innate force of matter.

We shall do neither Mr. Cheverton nor ourselves injustice by refraining from adding to these observations.—ED. M. M.]

THE NEW THAMES GRAVING DOCKS.

To the Editor of the Mechanics' Magazine.

SIR,—For eighteen years or more I have perused with pleasure the pages of the *Mechanics' Magazine*, and during that period have seen requests preferred by ingenious, but unnoticed men to have their letters inserted. Those requests have been kindly complied with; hence I am induced to ask a similar favour for this.

I have just read your paper (of May 23) on the "New Thames Graving Docks," in which you describe a method of proceeding recently patented by Mr. Edwin Clark. I claim the whole merit of theoretically expounding and pictorially illustrating, upwards of thirteen years since, the very method now introduced and patented as an entirely original idea. Moreover, whatever theoretical merit has hitherto been assigned to the elevating of the tubes constituting the Menai Straits Railway Bridge, that original merit I also claim, freely conceding to Mr. Clark the merit of having practically worked out my ideas.

I will now briefly relate my tale, and leave your readers to pass a verdict. Many years ago the Town Council of Liverpool offered a handsome premium for a "landing stage" at St. George's Pier. I wrote for, and obtained, the "conditions;" and, being of an "inventive genius," became a competitor. I sent down two large sheets of coloured drawings, with a long explanatory letter describing my landing stage, which I guaranteed should fulfil the "condition" of being there when wanted, and out of the way when not wanted. [Herewith I send you fac-similes of the two sheets of drawings.] As you will perceive, it was an hydraulic wharf; and the platform, bridges, or girders, were all to be elevated by what I called an "Hydraulic Pile" [of which I also send you a drawing]. I always considered my invention of that hydraulic pile as a simple, yet powerful and capital thing, and it was the very basis of my plan. My papers, after being publicly exhibited in the Liverpool Town Hall, were returned to me with "thanks," but no reward.

A few years after that I was struck with the modes of proceeding pursued at the Menai Straits Railway Bridge, and its remarkable resemblance to my plans. However, as there was a doubt, I held my peace; but now, as my hydraulic platform, moved and influenced by the hydraulic pile, is reproduced in its integrity at these new Thames Graving Docks, I keep silence no longer, but claim the priority and entire originality of idea, both in respect to them and also the mode of tube-elevating adopted at the Menai Straits Railway Bridge.

I am, Sir, yours, &c.,
CHARLES BURCHAM.
Projector of "Circular Tillage."

8, Upper John-street, Golden-square, W.

[Our correspondent appears to us to write rather more warmly than circumstances warrant. It is quite true, that he proposed (as appears from the drawings forwarded) the use of hydraulic columns for raising a platform out of and lowering it into the water; but as one end only of his platform was moved by these means, and as there are other features in Mr. Clark's invention besides the use of hydraulic columns, we think Mr. Burcham grasps at more than his own when he claims "the priority and entire originality of idea," involved in the Thames Graving Docks. At the same time, we think highly of his landing stage, and shall probably give an illustrated description of it shortly.—ED. M. M.]

AERIAL NAVIGATION.

To the Editor of the Mechanics' Magazine.

SIR,—I am always anxious to observe the strictest rules of courtesy towards those who may differ from me; but I must confess that my powers of endurance are sorely tried, when I find "An Amateur" discussing the merits of my Archimedean balloon, when he is evidently in utter ignorance of the construction of that machine, and of the principles on which it is based. Having read one of my letters, he presumes to answer the whole series of four; and, having a vague idea of what I propose to do, he fights with a phantom of his own creation, or raises objections to which I have already replied. If "An Amateur" will adopt the common-sense plan of reading my arguments before he replies to them, I shall be happy to hear of him again; but in the meanwhile I must decline wasting my time or occupying your space with disposing of that which has nothing to do with the question, or writing again what I have written before.

I am, Sir, yours, &c.,
J. PITTER.

254, High-street, Borough, London,
June 1, 1857.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

RENAULT, V. *Improvements in regulating and directing the steam escaping from the cylinders of locomotive engines.* Dated Oct. 2, 1856. (No. 2308.)

The object here is to give to the engine

driver the means of directing out of the chimney pipe the steam escaping from the cylinders, thus reducing the number of escape strokes or puffs.

DESMOND, D. *Improvements in vessels and apparatus for storing, improving, and discharging liquids.* Dated Oct. 2, 1856. (No. 2309.)

The object here is to receive or store beer, wine, &c., in vessels fitted with an apparatus which shall exclude atmospheric air, and permit the ripening of the beer, which will continue for any time, even although the beer be drawn off for consumption.

EDMESTON, R. *Improvements in looms for weaving.* Dated Oct. 2, 1856. (No. 2311.)

This is a combination of apparatus actuated by jacquard or pattern surfaces of the loom, in order to move the shuttle boxes to suit the pattern being woven. The cam shaft of the loom is caused by a tappet or cam to act on a lever in connection with the shuttle boxes, so that the shuttle boxes are lifted when the tappet or cam is, by the jacquard or pattern surface, allowed to act on the lever above-mentioned; but when the lever is moved out of the way of the cam or tappet, the shuttle boxes are not raised by the rotation of the shaft of the loom. The shuttle boxes are retained from descending by a catch acting in the teeth of the ratchet, carried by a lever which lifts the shuttle boxes, and the catch retains the shuttle boxes from descending to their lowest position, excepting when the jacquard or pattern surface causes the catch to be removed.

GOODYEAR, C. *Improvements in securing the opening of air-tight and other bags and packages.* Dated Oct. 2, 1856. (No. 2312.)

The edges of the opening are made with flanges, which, when the package is to be closed, are brought together, and a clamp is slid over them, which, by means of screws, is caused to press the edges of the opening together, so as to make an air-tight joint; or the bag or package may have a ring of metal fixed to it round the edges of the opening, and into the ring a plug is made to fit, and the plug or its seat is lined with elastic material, and is pressed into its seat, and secured by screw fastenings.

CROFTON, M. T. *An apparatus for indicating and registering the number of persons entering a public vehicle or carriage.* Dated Oct. 2, 1856. (No. 2313.)

This consists in combining certain novel mechanism into an apparatus formed with two dials or faces; one is covered with a sheet of glass, or a door of wood, and the apparatus is so fixed in the vehicle as that one dial shall be exposed to the persons within, whilst the other exhibits other smaller dials for registering tens, hundreds, and thousands. Inside the apparatus, there are three bells and levers corresponding to the different fares charged.

FONTAINEMOREAU, P. A. L. DE. *Improvements in the construction of roofs of buildings, which improvements are applicable to the construction of arches of bridges.* (A communication.) Dated Oct. 3, 1856. (No. 2315.)

This consists in a method of constructing the roofs, vaults, and other parts of buildings, and the arches of bridges, with timber or iron framing arranged in a similar manner to the voussoirs of the arch of a bridge.

HALL, J., jun. *Improvements in looms.* Dated Oct. 3, 1856. (No. 2316.)

This relates to "jacquard looms," and consists chiefly in working the box motion direct and indirect from the jacquard hooks, by means of horizontal and vertical levers, and also shafts, pulleys, or cams, so that, as the jacquard hook acts upon a horizontal lever, it causes a vertical lever to work the shuttle box.

JOHNSON, W. *Improvements in the treatment, preparation, or manufacture of sheet caoutchouc, and in the combination thereof with cloth and other fabrics.* (A communication.) Dated Oct. 3, 1856. (No. 2317.)

This relates to a mode of preparing sheets of caoutchouc and combining them firmly with cloth and other fabrics to produce goods for the manufacture of articles of various degrees of elasticity, and consists in preparing sheets of vulcanised caoutchouc by desulphurising their surfaces, by first boiling the sheets in caustic alkali, and afterwards in salt pickle to neutralise the alkali remaining on the sheet, and then washing the same. These sheets are then roughed on their surfaces, and the fabric to which they are to be applied is prepared by coating the surface thinly with a solution of caoutchouc dissolved in some solvent, and then thoroughly evaporating the solvent.

WILSON, G. F., and A. I. AUSTEN. *Improvements in the manufacture of soap.* Dated Oct. 3, 1856. (No. 2319.)

This consists in applying heated and free steam in and amongst the matters when using the caustic alkalies; and also in applying heated steam to heat the matters when carbonates of alkalies are used.

BOYD, D. O. *Improvements in constructing and arranging smoke and air flues.* Dated Oct. 3, 1856. (No. 2320.)

The object here is to facilitate the construction of air flues, to supply fresh air to, and withdraw vitiated air from, the several rooms of houses. In place of separating

the different flues of a stack by solid partitions, partitions are formed of hollow bricks of clay, iron, &c., laid one upon the other, so that the passages in the bricks range from top to bottom of the parts of the two flues which they divide.

ALLEN, J. *Improvements in coats.* Dated Oct. 3, 1856. (No. 2323.)

This consists in so forming a coat as that it may be readily convertible whilst on into three or more different descriptions of coats, such as a frock coat, a dress coat, and a hunting or sporting coat.

GARDISSAL, C. D. *Improvements in the manufacture of cement.* (A communication.) Dated Oct. 3, 1856. (No. 2326.)

Instead of manufacturing the mixture of lime and clay with water only, the patentee previously dissolves in the water one or several of the salts of magnesia, potassium, or soda, but common salt is preferred in the proportion of from 1 to 2 lbs. of salt to every 100 lbs. of cement.

PICARD, A. *An improved tobacco-pipe.* Dated Oct. 4, 1856. (No. 2327.)

This consists — 1st. In constructing tobacco-pipes with a reservoir upon the stem for collecting the nicotine, &c. 2nd. In instruments for the manufacture of the improved pipe.

NEWTON, A. V. *Improvements in supplying steam boilers with water.* (A communication.) Dated Oct. 4, 1856. (No. 2328.)

This is to keep the water of steam boilers at an unvarying level, and is applicable to boilers filled by an auxiliary engine. It consists in taking the steam by which such auxiliary engine is driven from the steam boiler at the exact level at which the water is required to stand in the boiler, by which means the steam which enters the pipe is so thottled in its way to the auxiliary feed engine by the water which passes with it, as to clog its operation to the extent necessary.

PRESTON, W. *Improved machinery to be used in the manufacture of paper hangings.* Dated Oct. 4, 1856. (No. 2329.)

The object is to damp the paper previously to its being passed through glazing or polishing machinery.

FARINA, M. *An improved tooth-powder.* (A communication.) Dated Oct. 4, 1856. (No. 2330.)

This consists in compounding tooth-powder of cream of tartar, orris root, calcined magnesia, cochineal, and Peruvian bark; to these are added cinnamon powder, and a decoction of geranium and rose leaves.

SILVESTER, J. *Improvements in the application of steam or air in the production of motive power.* Dated Oct. 6, 1856. (No. 2332.)

This consists in applying steam or air on one end of the piston, while a vacuum is simultaneously formed on the other end, for which purpose an extra slide valve of peculiar construction is used, and an air valve is affixed at each end of the cylinder.

GEDGE, J. *Improvements in the preparation of rocky substances for obtaining mineral manure.* (A communication.) Dated Oct. 6, 1856. (No. 2333.)

Claim—The manufacture of a mineral manure obtained (after chemical analysis) by roasting and pulverising rocks or rocky masses containing potassa, nation, and phosphoric acid, such rocks or rocky masses being phonite, basalt, porphyry, trap, felspar, granite, oxenite, gneiss, pearl, stone, obsidian, pummice stone, the different species of mica, hornblende, serpentine stone, ophite, and several species of limestone.

MACKWORTH, H. *Improvements in the separation and treatment of mineral substances, and in coking, and in apparatus connected therewith.* Dated Oct. 6, 1856. (No. 2334.)

This consists of several different processes adapted to the peculiar condition of the mineral operated upon, and the state into which it is desirable to reduce it as a commercial article.

DUNLOP, A. *Improvements in dressing or sifting flour or meal.* Dated Oct. 6, 1856. (No. 2335.)

These operations are effected by alternately slackening and tightening the dressing cloth, consisting of a suitable permeable material such as is used in ordinary dressing machines.

BARRATT, O. W. *Improvements in the dyeing or staining and ornamenting of articles of pearl, bone, and vegetable ivory.* Dated Oct. 7, 1856. (No. 2340.)

This relates to a mode of imparting a permanent dye or colour to articles composed of pearl, bone, or vegetable ivory. The patentee obtains the required tints from solutions of the metals, and the salts and oxides of the metals.

PARSSON, W. N. *An improved construction of rotary sawing machine.* Dated Oct. 7, 1856. (No. 2341.)

This relates to an arrangement of machinery whereby, with the aid of a circular saw, timber of nearly the same diameter as the saw may be cut across with facility. The patentee claims giving a compound traverse motion to circular saws.

BOTTOMLEY, S., and J. W. CROSSLEY. *Improvements in the manufacture of pile or nap fabrics.* Dated Oct. 7, 1856. (No. 2342.)

These relate to that class of fabrics where the pile is produced from weft, and consists in employing for such weft threads, yarns of worsted, alpaca, or mohair, with cotton

warp, in combination with means of treating the fabric when woven, and previous to the cutting of the rows of weft to form the nap or pile, to produce a light fine fabric suitable for ladies' dresses, &c.

HINKS, J. *A new or improved manufacture of metal boxes.* Dated Oct. 7, 1856. (No. 2343.)

This consists in the manufacture of metal boxes in which the body of the box and the grooves in which the ends are fixed, and also those in which the lid slides, are made of one piece of sheet metal.

WILKINSON, W. *Improvements in casters, in the legs of tables, chairs, pianofortes, and other articles of furniture, and in apparatus for perforating caster wheels, which is also applicable to the perforating of glass articles generally.* Dated Oct. 7, 1856. (No. 2344.)

This consists in constructing casters partly in glass or ironstone, and in the means of connecting the same to the legs of chairs and other articles; also, in forming the legs of articles of furniture by stringing on a shaft or rod ferrules of glass, with or without wood or ornamental work between all or some of the ferrules.

WILKINSON, W. *Improvements in ornamenting glass, and in the preparation of the materials employed therein.* Dated Oct. 7, 1856. (No. 2345.)

This consists—1. In interposing figured designs, pictures, prints, lace, and other fabrics and devices, rendered transparent or not, between two sheets or plates or surfaces of glass, whereby the device may be apparent on the face of either plate. 2. In rendering engravings, prints, &c., upon paper transparent, by first soaking the paper in oil, then drying it, and immersing it in turpentine or spirit; or the same design is printed on both sides of a sheet of paper, and in that state placed between two sheets of glass. The invention also comprises modifications of these arrangements.

BUNNETT, J. *Improvements in the manufacture of metal sash bars, columns, and mouldings for building and decorative purposes, and for a method of protecting the same or other articles from oxydation.* Dated Oct. 7, 1856. (No. 2346.)

These consist—1. In the manufacture of sash bars, columns, and mouldings of sheet iron, by drawing the iron between dies. 2. In covering sheet iron sash bars, columns, and mouldings, made as described, by the ordinary modes of japanning and polishing, or with glass and vitreous enamels, and producing on the same, and on sash bars, &c., of metal, ornamental designs in imitation of woods, marbles, muhl, or inlaid work, and other devices. 3. In coating sash bars, &c., of iron or other metal, with a protecting surface, by dipping them in, or by brushing them over, while in a clean and heated state, with a thin solution of asphaltum in spirits of tar or other solvent, and afterwards hardening the same by exposure to strong heat, this process being repeated until the required thickness is obtained.

WILSON, G. F. *An improvement in the manufacture of rosin oil.* Dated Oct. 7, 1856. (No. 2348.)

This consists in first subjecting the rosin to a process of distillation, with the atmosphere excluded, and then applying the rosin so obtained in the manufacture of rosin oil.

MARRIOTT, W., and D. SUGDEN. *An improvement in purifying coal gas.* Dated Oct. 7, 1856. (No. 2349.)

This consists in employing sulphuric acid by the dry process, by combining sawdust or shoddy with the sulphuric acid, which, becoming charred by the acid, produces a compound of sulphuric acid and such charred matters, suitable for being used in dry gas purifiers.

WARD, W. *An improved manufacture of woven fabrics.* Dated Oct. 8, 1856. (No. 2350.)

This consists in manufacturing woven fabrics with rough or uneven surfaces produced by snarls projecting from the weft or warp, or both weft and warp, this fabric being particularly applicable for making towels.

CHIOSSO, J. *An apparatus for damping and affixing adhesive stamps and labels.* Dated Oct. 8, 1856. (No. 2351.)

This consists in causing a rectangular box, fitted with a metallic sliding plate and handle, between which a reacting coil spring works, to be fitted with stamps or labels arranged perpendicularly within it with their adhesive surfaces downwards, in order to be readily moistened by the damping apparatus, and retained in their position by a small projecting lip or flange, so that when moistened, or pressed, or stamped upon the paper, the whole may be withdrawn and deposited singly by the simple operation of damping and stamping.

WHITEHEAD, F. *A method of and apparatus for producing devices in or on wood, leather, and other similar surfaces, whether for ornamenting the same or for the production of printing and embossing surfaces therefrom.* Dated Oct. 8, 1856. (No. 2352.)

This consists in the employment of an apparatus holding a tool or tools, made hot by gas (or otherwise) supplied to and round it, worked and directed by hand over a wooden or other block to be ornamented, or from which the printing or embossing surfaces are to be produced after the pattern has been sunk by the hot tool in the block.

BRADFORD, W. *Improvements in the arrangement of gas burners for lighting and ventilating.* Dated Oct. 8, 1856. (No. 2354.)

This relates to lights formed by a series of gas burners arranged in a circle, and consists in a circular supply pipe which has short branch pipes of small diameter radiating from it at intervals all round; the end of each short branch pipe, to which a burner is fixed, is bent upwards, so that each burner is in a vertical position. And in an arrangement for aiding the removal of the products of combustion.

FOXWELL, D. *An improved mode or method of consuming smoke and economising fuel thereby.* Dated Oct. 8, 1856. (No. 2356.)

This consists in supplying the furnace with compressed air, either continuously or at intervals, as may be required.

DUGDALE, T., jun. *An improved lubricator.* Dated Oct. 8, 1856. (No. 2357.)

This consists in employing a vessel in the inside of which is a tube with a trough or mouth at the top of it, the said tube passing through the vessel to the shaft to be lubricated, and in combination with this an endless chain is used, which dips into the oil, and carries it up to be transmitted to the shaft.

JOY, D., and W. HOLT. *Improvements in hydraulic motive power engines, and the application thereof to certain useful purposes.* Dated Oct. 8, 1856. (No. 2358.)

This relates to engines in which the piston reciprocates within the cylinder by the pressure of water, and comprises the use of a pneumatic lever for actuating the valves or cocks to admit water alternately on each side of the piston; the application of water pressure in a small cylinder to move the valves of the engine, instead of the pneumatic lever aforesaid; the employment of a spring for the same purpose, retarded in its action by the resistance of fluid in a reservoir, and permitted to escape by an adjustable opening; the application of such engine to work the bellows of organs, &c., and the use of a stop motion actuated by the bellows for regulating the supply of water or governing the engine.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GARDISSAL, C. D. *An improved construction of pump.* (A communication.) Dated Oct. 1, 1856. (No. 2301.)

This pump is furnished with suction and delivery pipes and valves, &c. With the space between the suction and delivery valves is connected a spherical air and water-tight chamber made of india-rubber, so as to admit of such chamber expanding and collapsing, which at the same time will remain air and water-tight; power is applied to this chamber to expand and contract or collapse it.

JONES, D. *Certain improvements in obtaining and applying motive power.* Dated Oct. 1, 1856. (No. 2302.)

This invention consists in obtaining motive power by the combined action of air, water, or other fluids on each other, by vacuum or pressure in apparatus of a certain described construction.

WILCOX, E. *Improvements in pumps.* Dated Oct. 1, 1856. (No. 2303.)

This consists in adapting to the upper part of pumps, and immediately over the discharge outlet pipe, a solid bucket or plunger, and in adapting a valve to the inside of the said discharge outlet.

WHITEHEAD, J. *Certain improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances.* Dated Oct. 2, 1856. (No. 2306.)

This has for its object the combining the principle of the jack frame for driving the several parts of the machinery, the superiority of the twist of the throstle, and the speed of the twist and delivery of the mule.

DISTIN, H. J. *Improvements in the means of regulating the tone of kettle-drums.* (A communication.) Dated Oct. 2, 1856. (No. 2310.)

This consists of an arrangement of the parts of kettle-drums contrived for regulating the tone of the same, which arrangement cannot be described without engravings.

HOPKINS, J. *Improvements in the construction of furnaces.* Dated Oct. 3, 1856. (No. 2314.)

The objects are—1. To promote the perfect combustion of fuel and prevent smoke; and 2. To prevent the furnace doors from becoming heated to an inconvenient degree; and these are provided for by certain arrangements of air apertures, &c., &c.

WRIGHT, L. W. *Improvements in gas-meters.* Dated Oct. 3, 1856. (No. 2318.)

The gas is supplied to the measuring part of either a wet or dry meter by tubes of vulcanized India-rubber, and is conveyed away from the measuring parts by other like tubes. The measuring apparatus consists either of two flexible vessels, expanded and contracted by being filled and emptied, or of two inverted vessels immersed in water. In this arrangement cocks and valves are dispensed with.

MOSQUERON, B. P. *An improved lamp-oil.* Dated Oct. 3, 1856. (No. 2321.)

An admixture of resin, colza, lignite, palm, seram oils, tallow, or oleine, &c., is

used, and a new mode of refining and deodorising such substances, by a longer boiling, with injection of water, diluted with some lye-water.

BROOMAN, R. A. *An improved lathe or tool suitable for turning, drilling, boring, planing, and smoothening, also for groving, mortising, and slotting, parts of which tool may be applied to lathes generally.* (A communication.) Dated Oct. 3, 1856. (No. 2322.)

This consists of machinery for the above purposes all combined in one apparatus, arranged vertically, and having a continuous rotary motion, and also a partial or an alternating intermittent motion, with arrangements for altering speed and the stroke or throw, and for reversing the action, so that it may be employed for parts of machinery the configuration whereof does not allow of the tool passing over all parts of their surface.

HASLAM, R. and J. *Improvements in looms for weaving.* Dated Oct. 3, 1856. (No. 2324.)

The object here is the stopping of the loom upon floating taking place. This is done by causing the weft thread to be severed from the action of the usual detector apparatus.

FARQUHARSON, C., and W. GRIMSHAW. *Improvements in apparatus for indicating and regulating the pressure of steam in boilers.* Dated Oct. 3, 1856. (No. 2325.)

The improved apparatus consists of a hollow flexible vessel filled with water subject to the pressure of the steam in the boiler, and which thereby distends the flexible vessel. The vessel has a tube stem depending from it. The inventors enclose this vessel and tube in a metal case fitting closely round it to prevent bursting. The lower part of the tube is connected with a bent metal tube which turns upwards, and then proceeds to the boiler. This bend is always full of water. A piston rests on the upper part of the vessel, and from this piston a rod projects upwards through the top of the metal case, and is connected with a lever across the top, which lever is suitably weighted. The lever works the damper in the chimney..

BETTELEY, J. *Improvements in the manufacture of iron for knees for ships or other purposes.* Dated Oct. 4, 1856. (No. 2331.)

This consists in making double tapered bars of iron by means of rollers of equal or unequal sizes, the forms of the double tapered bar being cut thereon. The inventor passes iron between the widest part of the rollers, causing them to revolve, producing thereby a succession of inclined planes in one bar, which, being cut through at the thinnest part, form double tapered shapes of iron from which knees can be made by bending the bar at the thickest part.

AVRIL, V. *Improvements in the manufacture of iron and steel.* Dated Oct. 6, 1856. (No. 2336.)

This consists in refining crude metal, and converting crude or cast iron into malleable iron and steel on its issuing from the blast furnace, and while still in a liquid and heated state, by heating it either with chlorate of potassa, or with nitrate of potassa. These salts are to liberate a quantity of oxygen in the hot mass of crude metal, refine it, decarbonise it, and effect its conversion into steel or malleable iron.

AVRIL, V. *Improvements in the manufacture of iron and steel and in the construction of furnaces to be employed therein; also in the obtaining of a certain agent employed in such manufacture.* Dated Oct. 6, 1856. (No. 2337.)

This consists in effecting the reduction and smelting of iron ore in blast furnaces by means of currents of oxygen in a pure and electrified state, or state of ozone, or in the incipient, or the most oxydating or condensed condition, and in refining the crude or cast iron, and converting it into steel and malleable iron while still in the blast furnace itself, and in a liquid state, by means of such currents. Also in improvements in the construction of blast furnaces in order to adapt them for the above; and in a method of obtaining the oxygen in the state required for the invention.

HAZARD, R. *An improved apparatus for intercepting the smoke and heated gases in its passage from boilers, stoves, furnaces, and kilns, to the chimney, and thereby extracting a portion of its heat, which is made available for drying and warming purposes.* Dated Oct. 7, 1856. (No. 2338.)

This consists of an apparatus so formed that the smoke and heated gases are distributed through pipes or small apertures to produce the largest radiating surface with the internal area.

SMITH, T. B. *Improvements in the permanent way of railways, and in the running of railway carriages.* Dated Oct. 7, 1856. (No. 2339.)

This consists in combining with the track now used, another track upon which the carriages shall slide after the manner of sleds. Also in placing the carriages upon runners like sleds. Also in the application of composition or amalgams to form the surface of the sliding track, and the surface of the runners in contact with the track.

FRANC, J. A. LE. *An improvement in lubricating oil cans or vessels.* (A communication.) Dated Oct. 7, 1856. (No. 2347.)

This consists in forming these cans or vessels so that they will assume such a position when placed on any surface, that the oil will not flow from the tubular neck through which the oil is poured when lubricating machinery, thus preventing waste by their being upset or turned over.

PONTIFEX, E. A., and G. H. OGSTON. *Improvements in the manufacture of tartaric and citric acids.* Dated Oct. 8, 1856. (No. 2353.)

The inventors decompose the tartars of argols in the ordinary way, by which an insoluble-salt of tartaric acid is obtained, and after the tartaric acid has been freed from the base with which it has been combined, they add to it sufficient sulphuret of barium to neutralize any excess of sulphuric acid present; and they then add sufficient chloride of barium to decompose any sulphate of lime that was originally present in the argols or tartars, or has been formed or dissolved during the before mentioned processes. For citric acid, after adding chalk to the lime juice and decomposing the citrate of lime so produced with sulphuric acid, the inventors treat the solutions of citric acid as before described with reference to tartaric acid.

LEIGH, J. *The use or application of a certain substance or substances in the manufacture of paper for stiffening and sizing the same.* Dated Oct. 8, 1856. (No. 2355.)

The inventor proposes to use silicate of soda and silicate of potash, either alone or in combination with other thickening or sizing substances, and to use the same mixed with the pulp in the process of the manufacture of paper, or after the manufacture, for the purpose of sizing or glazing it.

ILES, C. *Improvements in frames and stands, and in suspenders or pegs for holding or suspending hats, coats, and other articles.* Dated Oct. 8, 1856. (No. 2361.)

This consists—1. In coating with plastic materials, such as Keene's cement, the frames, stands, and pegs; and, 2. In making the frames or stands, and the plates to which the pegs are fixed, of sheet or rolled metal.

JULIEN, F. *Improvements in ordnance or cannon.* Dated Oct. 8, 1856. (No. 2362.)

This relates principally to breech-loading ordnance, and consists—1. In certain mechanical appliances for imparting motion to certain parts employed for facilitating the operations of introducing the powder and shot, and for discharging the same; and, 2. In certain mechanical arrangements for effecting the loading and discharging of cannon in continuous succession, principally by the agency of mechanism, instead of by hand.

PALMER, C. R. N. *A signalizing apparatus for carriages, and improved telegraph or signal apparatus, applicable to other purposes.* Dated Oct. 10, 1856. (No. 2375.)

Claims.—1. The use of an air tube, in combination with elastic balls, air vessels, or other analogous compressible apparatus, for making audible signals in carriages for arresting the attention of the conductor or driver, or both. Also the use, for the various purposes, of collapsible elastic vulcanised rubber balls, or hollow vessels of any other shape. Also the use (for working audible air signals at a distant point from one or more parts or branches of the same air tube) of vulcanised india rubber, moulded into balls, half balls, or hollow vessels, in combination with, and confined within an outer guard or covering of non-elastic material. 2. A mode shown of constructing the air whistle. 3. A mode of constructing, arranging, and operating bell-sounding apparatus as shown. 4. Various contrivances for connecting the air tubes together.

PROVISIONAL PROTECTIONS.

Dated February 3, 1857.

316. Julian Bernard, of the Albany, Piccadilly, gentleman. Improvements in fastenings for uniting wood, metal, cloth, leather, and other materials.

Dated February 6, 1857.

338. Henry Myers, of Rathbone-place, Middlesex, medical practitioner, Charles Askew and John Askew, of Charles-street, Hampstead-road, engineers. Improvements in railway and other breaks and communicator between the guard and driver of railway carriages.

Dated April 11, 1857.

1022. John Blythe Robinson, of Beverley, York, gentleman. Improvements in machinery or apparatus for effecting agricultural operations. A communication.

Dated April 16, 1857.

1078. Thomas Layzell Scowen, of Allen-road, Stoke Newington. The horizontal fin-expanding canopy for carriages, boats, and places.

Dated April 25, 1857.

1173. Charles Thomas Robert Prynn, of Newton Abbot, Devon. An improved apparatus to be used for totally or partially benumbing any part of the human frame previous to a surgical operation, for the purpose of performing the said operations without pain.

Dated April 29, 1857.

1201. Joseph Haythorne Reed, of Charles-street, Berkeley-square, major. Improvements in propelling ships or vessels.

Dated April 30, 1857.

1211. Frederick Walton, of Haughton Dale Mills, near Manchester, card-manufacturer. Certain improvements in the manufacture of plastic compositions.

Dated May 1, 1857.

1228. Pierre Alexandre Barteau, Gabriel Guy, and Charles Corroy, all of Paris. Improvements in the production of artificial stone.

1230. John Ratcliffe, of Blackburn, Lancaster, cotton-manufacturer. Improvements in preparing, or in machinery for preparing, yarns or threads for weaving.

1232. Alfred A. Blandy, M.D., of Baltimore, U.S. An improved mode of moulding and casting the plates or bases of artificial teeth.

Dated May 2, 1857.

1234. Samuel Hilton, of Albion-street, Bethnal-green, engineer. Certain improvements in furnaces.

1236. Alfred Augustus De Reginald 'Hely, of Oxford-street, glass-merchant. Certain improvements applicable in the burning of gas.

1237. Prime Raban Jones, of Clapham-rise, Surrey. An improved composition for the purpose of curing or preventing the scab in sheep and lambs, which will also greatly promote the growth of the wool, and destroy ticks, lice, and other vermin or impurities, keep the skin clean and healthy, and cure the mange in horses, dogs, and other animals.

1238. Henry Levy, of Sheffield, clothier. Improvements in moleskins, velveteens, cords, and such like materials.

1240. Alexander John Paterson, of Edinburgh, Esquire. An improved method of constructing and propelling vessels.

1242. Joseph Seelie Greenhow, of Chelmsford, Essex. An improvement in alarum apparatus when using electric currents.

1244. Benjamin Chew Tilghman, of Philadelphia, U.S. Improvements in treating fatty and oily substances.

1246. William Edward Wiley, of Birmingham, pen and pencil-manufacturer. Improvements in boxes or cases for containing needles, leads for pencils, pens, and other articles.

1248. Peter Fairbairn, of Leeds, machinist, and Thomas Marsden, of Broughton, near Manchester, gentleman. Improvements in machinery for heckling flax, hemp, tow, and other fibrous materials.

Dated May 4, 1857.

1250. John Fox, of Preston, builder. Improvements in the music scale, and musical instruments.

1251. Agostino Gatti, of Coppice-row, Clerkenwell. Improvements in the making of all kinds of seeds, buds, and fruits, for artificial flowers and fruits.

1252. John Stanley, of Whitechapel-road, mechanical engineer. Improvements in the construction and mode of applying cranes and other hoisting machines, to hoisting, suspending, lowering, and weighing purposes, also in generating, transmitting, and applying motive power for the same.

1254. Joseph Howard, jun., and William Howard, of Leek, Stafford, ironmongers. Improved apparatus for the manufacture of cheese.

1256. John Leslie, of Conduit-street, Hanover-square. Improvements in apparatus for ventilating buildings.

1258. John Thomas Way, of Welbeck-street. Improvements in obtaining light by electricity, and in employing light so obtained for lighthouses, and for giving signals.

1260. Jules Alexandre Petiet, of Rue Lafayette, Paris, engineer. Improvements in actuating railway breaks.

1262. Edward Davis, of Leeds, optician. An improved construction of pressure-gauge.

Dated May 6, 1857.

1276. Benjamin Hingley and Samuel Hingley, of Cradley, manufacturers. Improvements in anchors.

1278. Henry Tibbetts Ropes, of Liverpool, ice-merchant. Improvements in refrigerators or portable ice-houses. A communication.

1280. Henry Hogarth, of Adelphi-terrace, Strand. An improved apparatus for raising and floating vessels or other heavy bodies.

1282. George Tomlinson Bousfield, of Loughborough-park, Brixton. Improvements in machinery for pulverizing clay and other substances. A communication.

1283. William Edward Newton, of Chancery-lane, civil engineer. Improved machinery for manufacturing paper, part of which is applicable to other purposes. A communication.

1284. William Edward Newton, of Chancery-lane, civil engineer. Improvements in locks for doors, safes, and other purposes. A communication.

Dated May 7, 1857.

1288. Herbert Mackworth, of Clifton, Gloucester, mining and civil engineer. Improvements in the classification, preparation, and treatment of mineral substances, coke, and furnace cinders, and in removing and depositing such substances, and in machinery and apparatus for such purposes.

1290. Richard Bennett, of Redditch, Worcester, needle-finisher. A new or improved method of papering needles, or making up needles for sale.

1294. Charles Tilston Bright, of Harrow, Middlesex, engineer, and Charles De Bergue, of Dowgate-hill, London, engineer. Improvements in apparatus to be employed in the laying or sinking of submarine telegraph cables.

1296. Louis Charles Dolléans, of Paris, lithographic printer. Improvements in ornamenting porcelain, china, opal-glass, and similar products by lithographic chromo-lithographic printing and gilding.

1298. John Crawford, of Glasgow, ironfounder. Improvements in heating and cooking apparatus.

1300. William Colborne Cambridge, of Bristol, agricultural-implement maker. Improved machinery for winnowing corn and separating seeds.

Dated May 8, 1857.

1301. Frederick Grindlay Howard Woodward, of Horatio-terrace, Old Kent-road. Medicine for the cure of dropsy.

1304. Theodore Lipkan, of Rue de l'Echiquier, Paris, doctor of medicine. An improved antisyphilitic compound.

1305. Joseph William Schlesinger, of the Grove, South Lambeth, manufacturer. Improvements in the backs and covers of account books and other books. A communication.

1306. Louis Heinemann and Arnold Heinemann, of Manchester. Improvements in waterproofing woven fabrics and fibrous materials.

Dated May 9, 1857.

1308. George Heppell, of Uttoxeter, Stafford, engineer. Improvements in ventilating mines and such like places.

1310. John Henry Francis, of Ossulston-street, St. Pancras, and Robert Ord, of East-street, Islington. Improvements in the means and apparatus employed for cleaning casks.

1312. John Saxon Maccarthy, of Newman-street, Oxford-street, artist. Improvements in driving or ramming paving blocks and other surfaces.

1314. Andrew Peddie How, of Mark-lane, London, engineer. Improvements in circular brushes for sweeping boiler and other tubes.

1316. Henry Hobbs, of Cambridge-street, St. Pancras, contractor, and Edward Easton, of the Grove, Southwark, engineer. An improved mode of preventing the incrustation of steam boilers.

Dated May 11, 1857.

1317. Robert Wilson, of Patricroft, Manchester, engineer. Improvements in machinery or apparatus for raising or forcing fluids.

1318. James John Myers, of Bugle-street, Southampton, engineer and machinist. A new method of regulating paper laid on to be printed on one or both sides, at and by cylinder-printing machines, by means of guides, whereby the present waste of paper in progress of printing is avoided.

1319. Alfred Dawson, of Barnes-place, Mile-end-road, engineer. An improved wrought-iron cock, suitable for water, steam, or gas.

1320. Charles William Siemens, of John-street, Adelphi, civil engineer. Improvements in furnaces, and in the application of heated currents.

1321. John Miller, of New Lanark, N.B., manager. Improvements in oil-cans or apparatus for lubricating machinery.

1322. John Miller, of New Lanark, N.B., manager. Improvements in water-meters.

1323. William Geddes Borron, of Glasgow, glass-manufacturer. Improvements in closing or stoppering bottles, jars, and other receptacles.

1324. John Davies Mucklow, of Blackford-bridge, Lancaster, calico-printer. Certain improvements in the manufacture of rollers or cylinders to be employed for printing calico and other surfaces.

1325. Richard Fitton, of Oldham, Lancaster, cotton-spinner, and Samuel Hall, of the same place, overlooker. Certain improvements in machinery or apparatus for spinning cotton and other fibrous substances.

1326. Samuel Hallett, of Clarges-street, Piccadilly. Improvements in pianofortes. A communication from J. Becker, of New York.

1327. Alfred Vincent Newton, of Chancery-lane, mechanical draughtsman. Improved machinery for cutting veneers. A communication.

1329. Richard Archibald Brooman, of 166, Fleet-street, London, E. C., patent agent. An improved locomotive apparatus for rail and ordinary roads. A communication.

Dated May 12, 1857.

1332. Claude Antoine Busson, of Paris, engineer. Improvements in rotary engines.

1334. John Westlake, of Helston, Cornwall, mining agent. Improvements in cleaning, separating, and dressing ores of pulverised tin, copper, lead, silver, and other minerals, ores, and substances.

1336. William Henry Barlow, of Derby, civil engineer, and William Hemingway Mills, of Great George-street, Westminster, civil engineer. Improvements in the permanent ways of railways.

1338. Julien Charles Dubois, of Rue de Cherche Midi, Paris, statuaire. Improvements in castors.

1340. John Richard Cochrane, of Glasgow, manufacturer. Improvements in the treatment or manufacture of ornamental fabrics.

Dated May 13, 1857.

1344. Thomas Briggs, of Leeds, and John Starkey, of Liverpool, machinists. Improvements in machines for washing, wringing, and mangling.

1346. William Wolfe Bonney, of Fulham, Middlesex, manufacturer. A chemical composition or agent to be employed in lieu of, or to be substituted for, argol, tartar, and tartaric acid. A communication.

1348. Henry Tolkien, of London, and Joseph Middleton, of Finsbury. Improvements in pianofortes.

1350. Robert Stirling Newall, of Gateshead. Improvements in the manufacture of wire strands for electrical purposes.

1352. Nathan Ager, of Upper Ebury-street, Pimlico, Middlesex, carpenter. Improvements in connecting spindles of locks and latches with their knobs and handles.

1354. Michael Henry, of Fleet-street, London. Improvements in winding weft, and in the machinery employed therein, part of which is applicable to spinning machinery. A communication from Muloteaux and Co.

1356. William Adams Alderton, of Brighton, cabinet-maker. Improvements in spindles for door locks, latches, and other similar purposes.

Dated May 14, 1857.

1358. Valentin Sauerbrey, gunsmith, of Basle, Switzerland. Improvements in the manufacture of fire-arms.

1360. William Ashby, of Croydon, Surrey, millwright. Improvements in water-wheels.

1362. David Hesse and Max Hesse, of Manchester. Certain improvements in the manufacture of shirts, shirt-fronts, and other articles of wearing apparel.

1364. James Stevenson, jun., of Glasgow, merchant. Improvements in lighting apartments and passages.

1366. James Sharrocks, of Lower Healey, near Rochdale, brick-maker. Improvements in machinery or apparatus for pressing bricks, tiles, and other plastic substances.

1368. John Carr, of Killyleagh, Ireland, flax-spinner. Improvements in machinery for hackling flax, hemp, and other fibrous substances.

Dated May 15, 1857.

1370. Joseph Aizlewood, of Baths Foundry, Rotherham, stove-grate manufacturer. Improvements in hat and umbrella stands.

1372. William Hartley King, of Netherend, near Stourbridge, Worcester, manufacturer. Improvements in kilns and stoves.

1374. Robert Porter Walker, of New York. Improvements in machinery for hulling and scouring coffee and similar substances.

1378. Edward Gripper, of Winchester Wharf, Bankside, Southwark, corn factor. Improved machinery or apparatus for washing, drying, and cleansing corn, seed, Egyptian beans, or other pulse.

1380. William Marriott and David Sugden, of Huddersfield, agricultural and manufacturing chemists. Improvements in heating press-plates for pressing woollen, worsted, cotton, silk, or other fabrics, paper, and other articles.

1382. Richard Archibald Brooman, of 166, Fleet-street, London, E.C., patent agent. Improvements in machinery to be employed in the refining of sugar. A communication from P. A. de Coster, of Paris.

1384. Henry Brown, of Whitechapel-road, commercial agent. An improved material resembling ivory.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1419. George Sharp, of Jarrow, Durham, mill-wright, and William Elder, of the same place, engine-smith. Improvements in steam hammers and machinery for forging iron and other substances. May 20, 1857.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," June 2nd, 1857.)

179. S. Dyer. Certain improvements in ships' fittings, such as mast hoops, jib hanks, and jib and other travellers.

199. H. W. Wimshurst. An improved mode of manufacturing sheet metal.

202. A. Hemingway and T. Wheatley. Improvements in slide-valves for steam engines and other purposes.

203. G. Bedson. Improvements in coating iron and other metals with metals or metallic compounds.
204. C. F. Vasserot. An improved gasogene. A communication.
222. W. Stubbs and J. Burrows. Improvements applicable to water-closets.
223. F. Constance. An improved apparatus for casting and finishing types and vignettes used for printing.
225. J. Haile. Improvements in machinery for the manufacture of nails.
230. W. H. Brown. Improvements in coffins.
235. J. S. Crosland. Improvements in locomotive and other steam engines.
239. G. L. Doelling. Improvements in machinery or apparatus for forming screw threads.
243. J. Elce. Certain improvements in mules and other machines for spinning and doubling.
244. R. Harlow. Improvements in apparatus to be applied to steam boilers.
258. G. E. Dering. Improvements in lighting and warming trains of railway carriages.
267. W. Weild. Improvements in looms for weaving pile fabrics, part of which improvements are applicable to looms for weaving other fabrics.
277. F. W. Campin. The manufacture of a certain textile fabric, termed by the inventor "tissu courroie." A communication.
283. T. Affleck. Improvements in machinery or apparatus for pulping coffee.
285. J. A. Williams. Improvements in machinery or apparatus for ploughing or tilling land by steam power.
294. D. Howarth. The application of a substance, substances, or composition not hitherto used for sizing or preparing woollen or worsted yarns or warps for weaving.
296. W. Dray. An improvement in ploughs.
309. F. Garand. Improvements in transmitting motion and means of stopping it immediately.
312. J. Taylor. Improvements in the governors for the engines of screw steamers and other vessels propelled from the stern.
313. J. Taylor. A compensating crane.
331. P. Schäfer and F. Schäfer. Improvements in travelling bags or cases, and an apparatus for carrying fittings therein.
338. H. Myers, C. Askew, and J. Askew. Improvements in railway and other breaks and communicator between the guard and driver of railway carriages.
358. F. L. Bauwens. An improved mode of treating and distilling fatty matters, and in the apparatus employed therein.
381. B. W. Owrid. An improved method of connecting and disconnecting pipes or tubes.
394. T. Howard. Improvements in the construction of cranked shafts or axles.
395. H. Heald and A. Heald. Improvements in pickers and picker checks employed in weaving.
398. J. T. Pitman. An improved system of working metallic ores and their products, both metallic and mineral. A communication.
407. J. Horton, jun. New or improved machinery for regulating the generation and pressure of steam in steam boilers, and for the preventing the explosion of steam boilers.
493. W. Oakes. Improvements in the manufacture of iron.
670. R. J. Mary'on. Improvements in the construction of steam locomotive engines.
750. W. E. Newton. Certain improvements in artificial legs. A communication.
766. J. H. Taylor. Improvements in buckets and valve seats for bilge and other pumps.
1008. R. Turnbull. Improvements in slips or ways for heaving up and moving ships, and in cradles for the same.
1030. T. R. Winder. An improved mode of constructing submarine works.
1112. J. Underwood. An improved method of printing, and of preparing materials employed therein.
1244. B. C. Tilghman. Improvements in treating fatty and oily substances.
1247. J. P. Booth. An improved manufacture of stuffing for beds, couches, cushions, and other seats.
1248. P. Fairbairn and T. Marsden. Improvements in machinery for heckling flax, hemp, tow, and other fibrous materials.
1251. A. Gatti. Improvements in the making of all kinds of seeds, buds, and fruits, for artificial flowers and fruits.
1282. G. T. Bousfield. Improvements in machinery for pulverizing clay and other substances. A communication.
1284. W. E. Newton. Improvements in locks for doors, safes, and other purposes. A communication.
1288. H. Mackworth. Improvements in the classification, preparation, and treatment of mineral substances, coke, and furnace cinders, and in removing and depositing such substances, and in machinery and apparatus for such purposes.
1312. J. S. Maccarthy. Improvements in driving or ramming paving-blocks or other surfaces.
1321. J. Miller. Improvements in oil-cans or apparatus for lubricating machinery.
1322. J. Miller. Improvements in water-meters.
1323. W. G. Borron. Improvements in closing or stoppering bottles, jars, and other receptacles.
1340. J. R. Cochrane. Improvements in the treatment or manufacture of ornamental fabrics.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1129. Robert Crosland, William Holiday, and John Heaton.
1185. Henry Kraut.
1191. Joseph Ridsdale.
1205. George Alfred de Penning.
1215. Charles King and Edward Sutton Benfield.
1216. Walter Westrup.
1222. Thomas Greenshields.
1224. Benjamin O'Neale Stratford, Earl of Aldborough.
1225. Edward Orange Wildman Whitehouse.
1228. Isaac Tay.
1416. William Morgan.

LIST OF SEALED PATENTS.

Sealed May 29, 1857.

2825. James Dryden.
2832. Richard Harmer.
2836. John Gedge.
2837. John Gedge.
2838. John Coope Haddan.
2839. John Gibson.
2849. John Longbottom.
2853. Richard Archibald Brooman.
2865. Emory Rider.
2866. Thomas Crabtree.
2867. Adam Bullough and William Bullough.
2870. Joseph Deeley.
2886. Henry Moore.
2918. Anne Marie Macé.
2930. John Cornes.
2950. John Turner Wright and Edwin Payton Wright.
2952. Edward Paton and Charles Frederick Walsh.

2954. Henry Wimball.
2956. James Hartas Headley.
2960. George Sherwin.
2990. Frederick Levick, jun., and John James.
3004. François Donny.
3016. George Alexander Harrisson.
3044. James Lark.
3075. Richard Reeves Cox.
3084. Isaac Atkin and Marmaduke Miller.
3092. Jean Louis Celestin le François de Grainville.
62. Henry Charles Hill.
440. John Cruikshank.
698. William Charles Day.

Sealed June 2, 1857.

2858. Matthew Townsend.
2868. Henry Genhart.
2871. James Kinder Cheetham.
2874. James Apperly and William Clissold.
2915. Thomas Vicars, sen., Thomas Vicars, jun., Thomas Ashmore, and James Smith.
2961. George Tomlinson Bousfield.
2985. John Smith.
3015. Thomas White.
3039. James Robertson Dick.
3065. William Irlam.
5. Eugène Theodore Noualhier and Jean Baptiste Prévost.
557. Moses Haym Picciotto.
889. George Lauder and Thomas Ireland.
959. George Tomlinson Bousfield.
961. Samuel Clarke.
963. Alfred Vincent Newton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICE TO CORRESPONDENTS.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1766.] SATURDAY, JUNE 13, 1857. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

WALLACE'S STEAM DASH-WHEEL FOR BLEACHING AND CLEANSING.

Fig. 2.

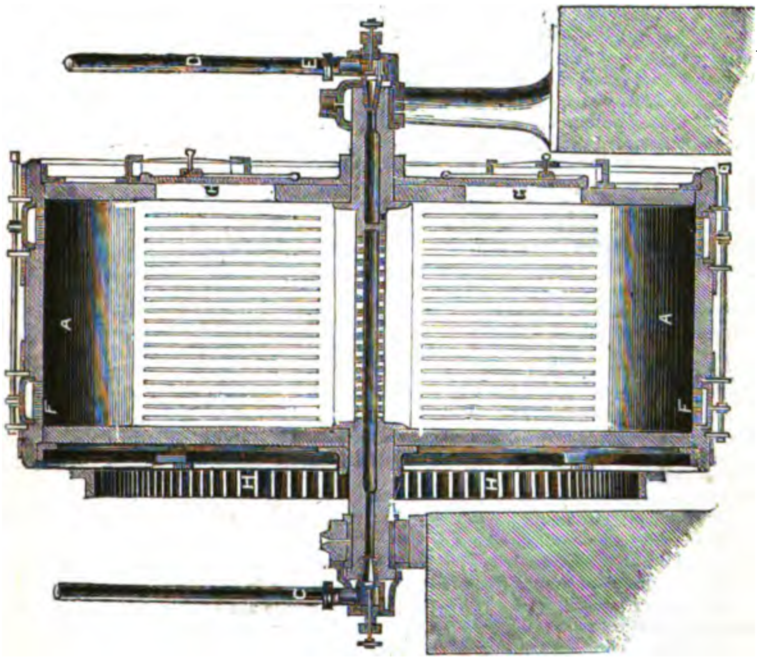
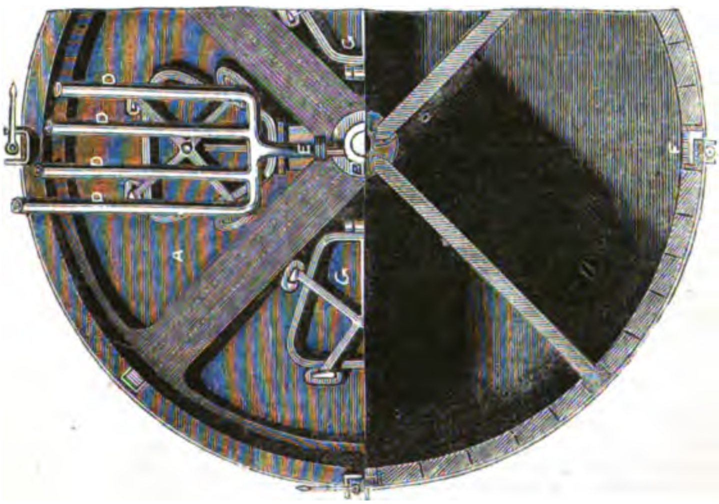


Fig. 1.



WALLACE'S STEAM DASH-WHEEL FOR BLEACHING AND CLEANSING.

An improved steam dash-wheel, which is likely to prove of very great value, was described by the patentee, Mr. James Wallace, jun., of Glasgow, at the meeting of the Institution of Mechanical Engineers, held a few months since in that city.

The object of the improvements which have been made is to render the dash-wheel more extensively available as a bleaching and cleansing agent for textile fabrics and other materials than it has hitherto been.

The improved wheel is shown in figs. 1 and 2 on the preceding page. Fig. 1 shows a part elevation and part transverse section, and fig. 2 is a longitudinal section of the dash-wheel. The dash-wheel, A, which in its general features is constructed like those hitherto in use, is mounted upon a hollow shaft, B, by which it is put in communication with a steam pipe, C. Steam is supplied through the hollow shaft into the several compartments of the wheel through perforations in the shaft. The introduction of the steam alone into the dash-wheel is sufficient to improve greatly the ordinary bleaching, washing, and cleansing and "posting" effect of the wheel; but with the farther introduction of acids, alkalis, soap, and other bleaching or preparing ingredients, the dash-wheel is made directly available as an excellent bleaching apparatus. The various preparations are contained in cisterns placed above the level of the range of dash-wheels, and a pipe from each cistern runs along the line of wheels, each pipe communicating with a branch pipe, D, leading to the hollow shaft, B, of the dash-wheel, the pipe, E, immediately joining the hollow shaft being connected to it by a stuffing-box joint. Each branch pipe, D, is fitted with a valve, in order that the quantity of each ingredient and the time during which it is admitted into the wheel may be easily regulated. The small quantity of water required in the process is also introduced through the same pipe, E, from one of the branch pipes, D. The fluids have egress from the wheel by outlets, F, at or near the circumference, as shown in fig. 2, the outlets being fitted with doors or valves by means of which they may be closed or opened at pleasure. The goods to be bleached are introduced into the wheel in the usual manner by doors, G, in the face or side.

The dash-wheel shown in the engravings is intended to be driven by means of a small single independent steam engine, the rotary motion being first imparted to a pinion, in gear with an internally toothed wheel or rim, H, upon the back of the dash-wheel. The smaller-sized dash-wheels are driven by bevil gearing from a shaft. The rate at which the wheels are driven depends upon their size; a wheel 6 feet in diameter must make about 24 revolutions per minute, whilst 16 revolutions per minute are sufficient for a wheel 9 feet in diameter; in other words, the velocity at the circumference is in each case about 430 feet per minute. The steam is introduced into the wheels at a pressure of from 3 to 5 lbs. per square inch above the atmosphere, and an engine working up to 5 horse power will drive a 9 feet wheel.

The system of bleaching hitherto in use differs widely from the process at present under consideration; the former is confined exclusively to what may be termed the quiescent or inactive system, the goods operated upon merely undergoing the change of a removal from one steeping process to another, with little or no agitation beyond that due to the boiling action. In the new process the fabrics to be bleached are at once placed in the rotating wheel, the chemical agents are introduced into the wheel, and the steam is turned on. During the rotation of the wheel the goods are subjected to a motion which is continually effecting a series of changes in their position, and greatly accelerates the cleansing action.

Various classes of goods may be thus treated, from the heaviest description of cotton or flax manufactures to the most fragile laces, without the slightest injury to the fabric. Perhaps what are termed sewed muslins or embroidered goods are the most difficult to bleach, from the almost indelible character of the ink, grease, and other extraneous matter, imbibed in the process of manufacturing, in connection with the delicate nature of the material. The patentee, as a manufacturer and bleacher of these goods, has had ample opportunity of fully testing his invention, which he has exclusively adopted for the last eighteen months. One of the most extensive bleaching firms of this class of goods in Scotland, Messrs. Cochrane and Armour, of Neilston, have also discarded their old process and adopted the new one. By the old system sewed muslins take thirty days on an average before they are returned by the bleacher, whilst with the new process they can be regularly finished in three days; and besides this great saving of time, there is also a great advantage from the fact that as much as 50 per cent. less of chemicals, soap, fuel, and labour is required with the steam dash-wheel. For linens this invention is invaluable, as it has been proved beyond doubt that the heavy linens and damasks made in the north of Scotland and Ireland can

be bleached in one-twelfth of the time, and at considerably less expense, by the dash-wheel, whilst none of the large tracts of ground at present occupied for grass bleaching will in future be required for this purpose, but may be all taken up for agricultural uses. Calicoes are bleached by this process at Messrs. Ormerod and Co.'s works, near Manchester, in six hours; whereas by the old process the time required to bleach these goods is nearly as many days. The steam dash-wheel may, in fact, be said to contain in itself a complete bleachwork.

The steam dash-wheel is also of great advantage to paper-makers, as an apparatus for removing the dirt and colour from the rags. Cotton waste, after having been used by engineers, has been cleansed and whitened, and made fit for use again in less than four hours. As a washing apparatus for clothes, it has many advantages, as a single wheel will do the work of 200 washerwomen.

MR. MACLISE'S PAINTING OF PETER THE GREAT.

Among the pictures in the exhibition of the Royal Academy this year, there is one which attracts the attention of every visitor, especially if he have mechanical tastes. It is an attempt by Daniel Maclise, Royal Academician, to represent a scene in Deptford Dockyard, in which the principal personages are Peter the Great, of Russia, engaged in manual labour as a shipwright, and William, Stadtholder of Holland, and King of England. The painter has succeeded admirably in contrasting the dignified self-possession of the king with the careless independence of the imperial artizan, and, hinting only at the uncivilised habits of the Russian by grotesque and barbarous associations, still leaves him a model of youthful grace and vigour. One turns with great relief from the careless daubs, which in too many places disfigure the walls of the Academy, to the exquisite colouring of this painting, and admires again the lace, and satin, and velvet, which Mr. Maclise always paints so well. The tools also, especially the saws with which the Czar and his attendant nobles, Menzikoff, Prince Siberski and others are working, are very capitally painted. But there is something in the arrangement of the picture which leaves a painful impression on the mind. The cause of this seems to be that the *distance* is very badly managed. There are a foreground and background, it is true, but there is no visible connection between them. The figures in the former are all painted with the same distinctness, and seem to be crowded together in a most uncomfortable way: those in the latter are small and carelessly painted. One effect of this crowding is that we are fearful lest the man with the uplifted adze should inflict some severe injury on one at least of the three persons, all of whom seem to lie directly in its course, as it describes a curve over his head, and descends to a rough log on which, in clumsy amateur fashion, he is practising. Then again, William must be supposed to have reached the position in which he stands from that in which Caermarthen and Shrewsbury are, but they certainly will be unable to get between the man sawing and the barrel and model, to follow him. But in addition to this, there are other defects which it lies more peculiarly in our province to point out.

Peter has just risen from the saw with which he has been sawing a piece of plank, and how he has contrived to get so far without cutting the foot of the courtier who steadies the piece for him, we know not. The saw kerf is very cleverly drawn, and in it is inserted a wedge, by which the separated portions of the plank are prevented from closing on the saw; yet, the saw remains in a vertical plane, with its centre of gravity considerably without the line of support, and with only one-third of the blade in the wood. We may suppose it to be falling, it is true, but such a thought distracts the attention of the observer, and suggests a want of that coolness and deliberation in Peter which his posture plainly indicates. Then, whoever saw a rough, unhewn log of oak that was not black and dusty? Yet here is one on which the Czar's dwarf is lounging, with a white satin coat most elaborately embroidered, and against which a little actress is leaning, as she sits on the ground by its side. In the background of the picture two slips are shown, one of which—an empty one—appears to be level; but slips with a considerable declivity are not such a modern innovation as Mr. Maclise seems to suppose. The other is occupied by a line-of-battle ship, and in this there is some sad drawing. One side appears to be nearly twice as broad as the other, and the diversity in the sheer of the lines running above and below the ports, says much for Mr. Maclise's powers of invention. Again, the bottom of the ship is sheathed, apparently with lead; but Mr. Maclise will never make us believe that the ancestors of the men who now lay the edges of the sheathing in such fair and graceful curves on the bottoms of our men-of-war could have displayed such

wretched taste in that matter as he insinuates; and they certainly would not have been so unwise as to lap the butts of the sheets towards the bow. The sheets themselves must be, judging from the size of the ship, quite ten feet square. How flat sheets of such a size could be laid smoothly on a surface so stubbornly undevelopable as the bottom of a ship, we are at a loss to imagine. Perhaps Mr. Maclise thinks the nails with which they are fastened, and which he shows to be at least *six inches* in diameter, would assist in getting over the difficulty. Finally—for such criticism seems to us almost like sacrilege — there is, under the head of the ship, a rudder in course of construction, the back or head of which is bent according to the modern practice, a practice, however, so modern that Mr. Maclise ought certainly to have known better than to be guilty of such an anachronism. A great number of the war ships now in existence have straight rudders, in accordance with the old fashion. And, worse than this, the rudder is like that of a small boat—flat, and of the same thickness from the top to the bottom.

We hope that when such men as this highly-talented painter honour the workshops of English artizans with their brilliant pencils, they will take a little more pains to avoid such errors as those we have pointed out, that the artizans themselves may gaze upon the results of their skill with as much pleasure as the rest of the world.

INSTITUTION OF CIVIL ENGINEERS.

THE MANBY TESTIMONIAL.

The Members of the Institution of Civil Engineers had, for some time, entertained the intention of demonstrating, in an appropriate manner, their personal esteem for Mr. Charles Manby, with their sense of the valuable services rendered to them individually and collectively, and at the same time of acknowledging the ability with which he had, during eighteen years, performed the duties of secretary to the society. Advantage was taken of the opportunity of his retiring from the post of paid secretary, to carry this intention into effect; a committee was formed, and in a very short period upwards of 2000*l.* was subscribed, with which it was determined to purchase a fitting testimonial and to present the balance in cash. The ceremony of presentation took place in the theatre of the Institution, on Saturday, 23rd May, in the presence of a large assemblage of the members and of Mr. Manby's private friends, who had been permitted to join in the tribute to his merit. We should be happy to add, if it were possible, to the demonstration made in recognition of Mr. Manby's services in filling an office which not one man in ten thousand is fitted for—the secretaryship of an important professional society; but the testimony of the officers and members of the institution is so high and so unanimous, that it is not in our power to add to his honour.

Mr. Robert Stephenson, M.P., the President of the Institution, took the chair, and called upon Mr. Bidder, as treasurer of the fund, to communicate the result of the exertions of the committee.

Mr. Bidder explained that, owing to the eagerness with which their call was responded to, the duties of the committee had been comparatively light. The amounts subscribed varied from half-a-guinea to one hundred pounds; and those who had contributed the latter sums had done so as cheerfully as those whose means only permitted them to offer the smaller amount. Up to the present time there had been received 2,019*l.* 10*s.*, from 417 subscribers, of whom 358 were members of the Institution, and 59 were the private friends of Mr. Manby; but as many more subscriptions had been announced, the accounts would not be finally closed until the publication of the list of the contributors to the testimonial. It had afforded him great pleasure to aid in this demonstration, for as a very early member of the Institution, he well knew the arduous duties of the secretary, and he now bore willing testimony to the able and kind manner in which those duties had been performed.

Mr. Robert Stephenson, President, said the object of the meeting was well known; Mr. Manby having—after eighteen years' service—resigned the position of paid secretary, it had been resolved to offer to him a testimony of the respect and esteem in which he was held, and in doing this he would make a few brief observations on the circumstances under which Mr. Manby had become connected with the Institution, the duties he had performed, and the services he had rendered. After the usual struggles and vicissitudes, the young society, although very ably directed by Mr. Thomas Webster, had scarcely established itself among the scientific bodies of the metropolis. The minutes of its proceedings were but meagrely reported, and its transactions were scarcely known beyond the members themselves. From the time, however, when Mr. Manby undertook the duties of secretary, new vigour was infused into all their proceedings, the number of members increased, the character of the papers improved, and the care bestowed on the editing and publi-

cation eventually rendered the records of the proceedings a most useful text-book for the profession. Mr. Manby's sphere of usefulness was not, however, confined to the performance of his official duties, for he was ever ready to give advice to the younger members, and to afford aid to the senior members, from his well-stored mind, in reference to every department of engineering, as well as in a variety of ways, rendered more pleasing by the alacrity and cheerfulness with which the friendly offices were performed. The value of the information afforded was enhanced by its accuracy, which was to some extent to be attributed to the practical foundation of his professional education, the early portion of his life having been spent in the workshop, as a mechanical engineer, at the period when the profession was beginning to assume its present importance. In some degree, therefore, Mr. Manby lost the official character of secretary, and became the friend and companion of the majority of the members of the engineering profession.

Addressing Mr. Manby, he then said, "I have been extremely brief in my remarks, as I would divest our present proceedings of all stiffness and formality; and it is with great pleasure, Mr. Manby, that in confirmation of what I have said, and of the sympathy felt for your welfare by so large a number of engineers, I have to present to you, on behalf of the members of the Institution and a few private friends, this testimonial, consisting of a timepiece and a pair of candelabra, with the sum of two thousand pounds, and long may you live to enjoy the recollection of the honours of this day."

The timepiece and candelabra, supplied by Messrs. Howell and James, appeared to afford general satisfaction by their elegance and the good taste with which they had been selected by the committee. They bore the following inscription: "Presented by the Members of the Institution of Civil Engineers and a few personal friends, with the sum of Two Thousand Pounds, to Charles Manby, as a token of esteem, and in recognition of his valuable services, during a period of eighteen years, as Secretary of the Institution, May, 1857."

To the president's kind address Mr. Manby, who appeared to be much affected, immediately replied, that it rarely fell to the lot of any one to receive so gratifying a token of the esteem of those with whom he was in daily contact, and to have the presentation accompanied by such kindly expressions; if he was previously at a loss how to express his feelings, the difficulty was now increased, and he must crave indulgence if the few words of thanks he could utter appeared inadequate to the occasion. They must not believe him insensible to their kindness; it had been so constantly shown, that he should indeed be ungrateful if it had not made a deep impression; and but for the consciousness of having always endeavoured strenuously to perform his duty, he should feel that his poor services had been much overrated. He then traced, in graceful and generous terms, his connection with the Institution. Among other things, he stated that it had been a pleasing duty to him to give a cordial welcome to all foreign engineers and scientific men, and to obtain for them that favourable reception they might not otherwise have experienced. It only depended on the members to extend its sphere of utility, and to connect the Institution with the records of the great works distinctive of the nineteenth century. The remainder of his days would probably have been passed in the prosecution of these views, but events were otherwise ordered, and since his resignation as paid secretary had been tendered and accepted, he had again to be grateful to a member of the profession, for obtaining for him that which he valued very highly,—his present connection with Mr. Robert Stephenson, the excellent president. He asked as a favour to be permitted to devote a portion of the amount of the testimonial to establishing an annual premium which should bear his name. There was another point on which he would wish to say a few words; the engineering profession reckoned among its numbers many rich and prosperous men, but there were also many less fortunate members, to whom aid in time of sickness, or need, or succour to a struggling and bereaved family, would be inestimable. Yet the engineers were the only professional body not possessing some kind of a mutual-aid society. Would it not be possible to originate some plan for thus doing good? His time and means might be freely commanded, and he should feel happy in devoting to such an object a further portion of that which had been so generously placed at his disposal. As long as his services could be made available to the Institution, or to the members, within those walls or elsewhere, they might be freely commanded.

Mr. Locke, M.P., vice-president, proposed a vote of thanks to the president for having taken the chair on the occasion, and having so kindly expressed the unanimous feelings of the members towards their valued officer and friend, to whom they all wished every prosperity in the career in which he was now embarked.

The members and their friends then adjourned to the "Ship," at Greenwich, where they had invited Mr. Manby to dine; Mr. Robert Stephenson, Pre-

sident, occupied the chair, and after an excellent repast in Mr. Quartermaine's best style, the Chairman proposed the usual loyal toasts.

In proposing the principal toast of the occasion, he said he had already imperfectly expressed his own feelings and those of every member of the Institution, with regard to the eminent services rendered by their friend, Mr. Manby, during so many years; there was not an individual in the room, or belonging to the Society, who had not experienced in some manner his kindness and urbanity. In fact, all classes owed him much, especially for his exertions in bringing them together within the walls of the Institution, where in assembling for the promotion of the general good of the profession, they obliterated the feelings which were sometimes engendered by the violent professional contests in which they had all been engaged. Mr. Manby had originally undertaken a difficult task; it was essential to win the confidence of all around him, and then to use the power with discretion; this he had done most successfully, devoting himself to reconciling these differences that must occur, and rendering the Institution almost indispensable to the profession. He had no hesitation in saying that the present position of the Society was almost entirely to be attributed to the exertions and skill of his friend, Mr. Manby, whose health and prosperity he begged to propose.

Mr. Manby, in responding to the toast, said, he had been fortunate in having the direction and advice of a Council comprising the most eminent members of the profession, who had always given him their frank co-operation. He could not help entreating them never to lose sight of the Institution, which had been and would still be the means of conferring the greatest benefit upon the profession to which all were proud to belong. He was convinced that if they extended to his friend and former pupil, Mr. Forrest, whom he had much pleasure in seeing appointed as Assistant-Secretary and eventual successor, the same kindness and confidence they had shown to him, everything would be done to promote the interests of the Institution, and to enlarge its sphere of usefulness. Although he had now retired from the position of paid Secretary, it had been considered desirable that he should still retain the title of Secretary, and perform the duties. He felt great pride in receiving this additional mark of the confidence of his kind friends.

Mr. Locke, M.P., said he was permitted to propose a toast which, he was assured, would be received with enthusiasm; it was the health of that excellent man and distinguished engineer, Mr. Robert Stephenson, who now so worthily presided over the institution. No man occupied a more prominent position than their excellent President, and no man was more worthy of that position. His history was that of most of the great men of this country; he had sprung from the ranks of the people, and by his own efforts alone, he had attained his present high reputation, and established a fame which was indissolubly connected with the greatest works of the present period.

Mr. Robert Stephenson, in returning thanks, cordially subscribed to all that had fallen from Mr. Locke, with respect to the advantages afforded by the Institution. He regretted the absence of his friend, Mr. Brunel, with whom he had maintained arduous struggles, which he could now look back upon with such pleasure as almost to desire to fight again "The Battle of the Gauges."

Mr. Field said, as one of the founders of the Institution, and now he believed the oldest member, he well recollected the time when their meetings were few and small in numbers; and their ultimate success was very problematical; their great difficulty was to find a secretary combining all the qualifications they required, because such a man would possess engineering knowledge and other talents which would enable him to strike out a more profitable course. They tried many good men, and he despaired of ever finding the proper man, but at length his old friend, Mr. Manby, was prevailed upon to take the position, and for the last eighteen years they had all witnessed the success of his efforts. They had in prospect, as his successor, a gentleman who was well known to them from his long association with Mr. Manby, as his pupil, and who appeared to be just the person they wanted. He begged to propose, "Success to the Institution of Civil Engineers," coupling with it the name of Mr. James Forrest, the Assistant-Secretary.

Mr. Forrest said, that through the kindness of his friend, Mr. Manby, he had been incidentally connected with the Institution for nearly fourteen years, and by the Council he had been selected to succeed to the office which had been so long and so ably filled as to merit the demonstration of the day. He only hoped that when he stepped into the position with his responsibilities, he might, by following the footsteps of his predecessor, equally merit their confidence; he should try to do so, and with their kind assistance he trusted to performing the duties of the post so as to promote the best interests of the Society.

THE LOST SPECIFICATIONS OF PATENTS.

Some years back there disappeared from amongst the parchment records of the dark caverns, known as the Petty Bag, sundry rolls of specifications of patents. In process of time they were missed, and the hue and cry of Chancery was strong upon their trail. Some were recovered, but others—so runs the tale—were chaffered away by a boy with a strong appetite for tarts, in order to be converted into jelly, after the fashion of parchment chips and ivory turnings.

Amongst the number lost was one by a Mr. John Day, entitled, "An Improvement or Improvements in the Construction of Railways," dated January 22nd, 1835. We hope yet to see this printed by the Commissioners; for although the recorded copy is missing, there are probably others existing. Meanwhile we shall do our best to enlighten the public on this patent, by documents which have fortunately fallen into our hands.

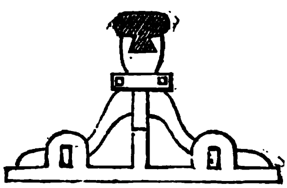
Previous to the abstraction of Day's specification a gentleman, who was reading up patents on permanent way for his own purposes, took notes and sketches of Day's as follows:

"1835. J. Day, Jan. 22. The object of this invention is to dispense with the chairs and the stone or wooden bearers or sleepers. It consists in constructing the rails with a flange or base plate (shown at *a* in the end view, fig. 1, and perspective view, fig. 2), which is to be buried in the ballasting of the railway, having an upright edge plate, *b*, formed upon it, strengthened by supporting brackets, *c*. The plate, *b*, stands above the

surface of the ballasting, and is made of a suitable shape for the carriage wheels to run upon, or else the upper part of it is enlarged, as shown, and has a groove, *d*, in it to receive the iron bar or rail, *f*, which is secured in the groove by wedges, *g*, driven in at the ends of the groove. The rails are connected together by bolts passing through the eyes, *h*, at each end, and secured by keys. They are prevented from rising one above the other by each having at one end a projection, *i*, which enters an opening in the end of the next rail, and is secured by the bolt, *j*, the bolt being secured in its place by passing a key through each of the openings, *k*. The two lines of rails constituting the railway are connected together and kept parallel by transverse bars, the ends of which are inserted through holes, *l*, in each rail, and secured by keys. A modification of this arrangement is shown in section at fig. 3; the base plate, *a*, and edge plate, *b*, are composed of two parts connected by the bolt, *m*, and keys, *n*, also hold the bar, *f*, securely in the groove or the upper part of the edge plate; *c e* are the supporting brackets for the plate, *b*, instead of the edge plate being enlarged at the upper part, and having a groove to receive the bar, *f*; the whole may be made of the same thickness, and the bar, *f*, formed in two parts, thus (see sketch) meeting over the top of the edge plate, and secured by screws, *p*.'

By the following sketches, taken from the specification, these notes are made clear:—Fig. 1 is a plate, laid with a deep vertical

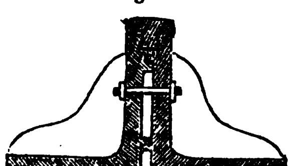
Fig. 1.



rib rising on it, reinforced by angles or brackets. The upper part of the vertical rib ends in a continuous under-cut groove in which the rail is keyed, the base plates being continuous and connected together by bolts passing through lugs.

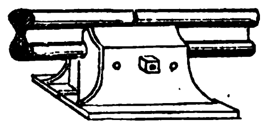
Fig. 3 shows a similar plate, but divided

Fig. 3.



longitudinally into two halves, joggled and bolted together by bolts and keys, the bolts passing through below the rail, which is nipped by the dovetail groove, and thus secured without wedges or keys.

Fig. 2.



The next sketch (fig. 2) shows the rails bolted together in two halves to the top of the rib.

So far the "Notes."

The next evidence we have is a lithograph, published by Mr. Jobbins in 1836—7, and largely distributed. It is headed:

"John Day's Patent Cast-iron Railway Base Plates; showing their advantage over Stone Blocks and Chairs."

The illustrations are "Elevation of Rail and Base Plates 15 inches apart."

"Elevation of Rail and Base Plates 30 inches apart."

"Elevation of ordinary mode of supporting Rails on these Blocks 5 feet apart."

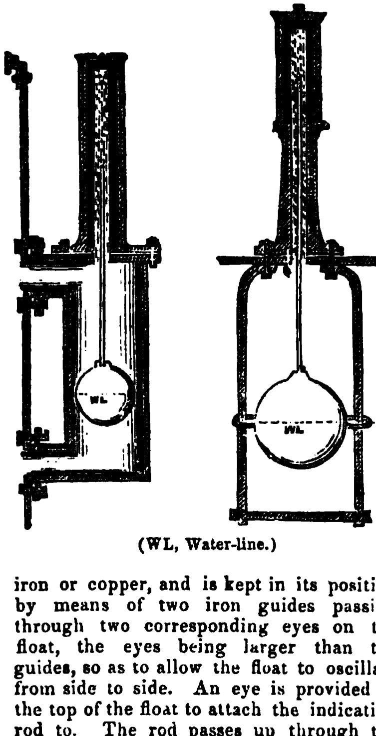
The form of the base plates is as fig. 3—two parts bolted together below the rails. The principle is that of the cast-iron sleepers laid down some years back on the South Eastern Railway.

Subsequently to this another lithograph was published by Messrs. "Day and Haghe, Lithographers to the Queen," of which the title is "John Day's Patent Cast-iron Base Plates for Railways." In this the base plates are used as chairs in two parts, bolted down upon wooden sleepers, the idea of dispensing with sleepers having apparently been abandoned. We give the sketch of a joint chair and sleepers. The chair is in two parts, extending on the two wooden sleepers to which it is bolted, the bolts passing through the two half chairs below the rails, which are confined in niches of the chairs by their lower tables, which are held as in a vice, and the joint is practically fished.

There have been many inquiries at the Patent-office respecting this lost specification, and we trust that this notice of ours may prove efficacious in bringing forth the original. Meanwhile the sketches we have given are, we trust, sufficient for the practical mechanic desirous of knowing what has been done before.

JOPLING'S IMPROVED WATER GAUGE FOR BOILERS.

Mr. T. T. Jopling, of Sunderland, has introduced an improved water gauge, adapted for high-pressure, condensing, marine, and locomotive engines. The object of the improvement is to secure a correct indication of the level of the water in steam boilers, and to obviate the serious defects of the gauges at present in use. It may be considered as a combination of the float gauge and the glass tube gauge, and is free from the defects of these instruments. The float, which is shown in the accompanying engravings, consists of a hollow globe of



(WL, Water-line.)

iron or copper, and is kept in its position by means of two iron guides passing through two corresponding eyes on the float, the eyes being larger than the guides, so as to allow the float to oscillate from side to side. An eye is provided on the top of the float to attach the indication rod to. The rod passes up through the boiler into a steam-tight glass tube, which is fixed to the boiler by a pedestal. By this arrangement, the float rod requires no stuffing-box to pass through, by which the liability to stick, so fatal to the float rods at present in use, is removed. On the other hand, the glass tube never requires cleaning, but remains cool as there is no passage through it for steam. All tendency to burst by expansion is thus obviated. The float rod is kept in constant motion by the ebullition of the water, which gives a satisfactory evidence of its proper action at all times. The simplicity and certainty of action of this float are great recommendations.

THE NEW INDUCTION COILS.

To the Editor of the Mechanics' Magazine.

Sir,—May I ask the favour of your inserting a few remarks from me, in vindication of my claim to priority, in the introduction of the improved and very powerful modification of the induction coil in England. I feel called upon to do so in consequence of a note from Mr. Bentley, which has appeared in the *Philosophical Magazine* for this month, in which he comes forward to vindicate Dr. Noad's treatment of me. I would venture to suggest to Mr. Bentley, that if Dr. Noad's conduct admits of justification, he is quite competent to give any explanation which may be necessary. Mr. Bentley expresses his regret that Dr. Noad's "disinterestedness" in giving publicity to the productions of a "stranger," viz., himself, should have called forth such statements as I had made in the former number of the *Philosophical Magazine*, and by quoting detached portions of my remarks, he has connected them in such a way as to endeavour to make it appear that I had complained of commercial injury sustained by this act of Dr. Noad's, and asks, "Would it have been just to suppress my humble attempts at improvement for the sake of Mr. Hearder's pecuniary advantage?" I beg to assure Mr. Bentley that he labours under a mistake if he imagines that I have complained of the simple fact of Dr. Noad's having introduced his machines to the public. I have before told Dr. Noad in private, and I again repeat it, that he only did his duty to the public as a chronicler of scientific improvements when he brought forward Mr. Bentley's machine. But it is my turn now to ask, whether it was *just* in Dr. Noad, when he introduced Mr. Bentley's machine to the public as a novel invention, to suppress the fact that a similar machine was made by me twelve months before; that it was used by Dr. Noad himself six months previously at Plymouth; that I had entrusted the particulars of that very machine to him for publication in his new work; that I had promised him not to publish anything myself until his work was out; that he had assured me that it would be published in April, 1856; and that those particulars, at the time when he introduced Mr. Bentley's machines, were still locked up in his possession from the public. If there were no

other disadvantage arising from these circumstances, it has afforded an opportunity to call in question my claim to the honour of priority. Mr. Bentley states, in the *Philosophical Magazine* for the present month, page 471, that the machine which Dr. Noad exhibited on September 29th of last year was commenced in January and finished in March, 1856. It is rather strange that Mr. Bentley should have made such an amazing improvement as early as March, and should have waited until September to ask Dr. Noad to allow him to try his against one of Ruhmkorff's machines. Mr. Bentley's statement does not at all correspond with that of his friend, but I do not attempt to question its accuracy; and assuming the date given by him to be correct, I can only state that my machine was commenced early in 1855, and completed about the middle of the year. In November, 1855, I communicated the minute details of its construction to Mr. Grove; and as early as December, 1855, I had worked out the major part of the results which I had the privilege of detailing in February last to the London Institution and Society of Arts, and which you also honoured me by noticing very elaborately in your numbers for March 21 and 28 (Nos. 1754, 1755). I also lectured at the Plymouth Institution in March, 1856, and exhibited the instrument, and a notice of that lecture appeared in the *Journal of the Society of Arts* in May following. In March, 1856, Dr. Noad used my machines at the Plymouth Mechanics' Institute, and tried it against one of Ruhmkorff's, which he pronounced greatly inferior to mine. I also showed the machine in the same month to Mr. Gassiot, and my friend Sir W. S. Harris, at my own residence. In August, 1856, I made further improvements on the machine; and in September, being tired of waiting for Dr. Noad's book, and fearing the possibility of being forestalled, I exhibited the machine at the Royal Cornwall Polytechnic Institution, and received their silver medal on the 17th of that month. I presume that this is sufficient to establish my claim to priority. In conclusion I may remark, that some of the contrivances of my machine are very peculiar; and it is a remarkable fact, that every contrivance adopted by Mr. Bentley was embodied in my original machine. It is quite possible, however, that Mr. Bentley knew nothing of my arrangements; and the fact of the identity of the results which we have obtained will thus serve to show that we have both travelled in the right direction.

I am, Sir, yours, &c.,
JONATHAN N. HEARDER.

28, Buckwell-street, Plymouth,
June 6, 1857.

VIEWS FROM A BALLOON.

At the conclusion of a lecture, recently delivered at the Royal Institution, by E. Vivian, Esq., M.A., a narrative was given of a balloon ascent, illustrated by drawings of aërial phenomena, from sketches taken on the spot. The chief peculiarities of these were, the altitude of the horizon, which remained practically on a level with the eye at an elevation of two miles, causing the surface of the earth to appear concave instead of convex, and to recede during the rapid ascent, whilst the horizon and the balloon seemed to be stationary; the definite outlines and pure colouring of objects directly beneath, although reduced to microscopic proportions, occasioned by the absence of refraction and dispersion of the coloured rays when passing perpendicularly through media of different densities, which, at an angle, produce aërial perspective; the rich combination of rays bursting through clouds, and having the sun's disc for their focus, contrasted with shadows upon the earth, which radiate from a vanishing point on the horizon; the narrow shadows of clouds and eminences, such as Harrow and Richmond, being projected several miles, as seen in the lunar mountains; the magnificent Alpine scenery of the upper surfaces of cloud, still illumined, at high altitudes, by the cold silvery ray, contrasted with the rich hues of clouds at lower levels, and the darkness of the earth after sunset. At higher altitudes than could be attained, and above the level of perpetual congelation, were the beautiful cirrus clouds, composed of snow crystals, in every form and rich development of the original hexagon, affording the materials for a new æra in architecture, and designs from Nature's hand for a crystal palace. In acoustics, several interesting phenomena were noticed. The sound of London rolled westward as far as its smoke, but was lost above the clouds, where the most intense silence prevailed, as also near the surface of the earth, showing that sound ascends. The electrical phenomena of lightning, hail, the peculiar forms of thunder clouds, and the aurora borealis, were beautifully illustrated with the instruments of the institution; and photographs of natural clouds were exhibited, as also a method of introducing them by a second's negative in printing landscapes.

DE LA RUE'S ENVELOPE PATENT.

COURT OF QUEEN'S BENCH, WESTMINSTER, MAY 27—8.

(*Sittings in Banco before Lord Campbell and Justices Coleridge, Erle, and Crompton.*)

DE LA RUE *v.* DICKENSON AND OTHERS.

SUBSEQUENTLY to the trial reported at page 182 of our Number 1750, for Feb. 21, a rule was granted calling on the plaintiffs to show cause why the verdict should not be set aside, and a verdict entered for the defendants, or why there should not be a new trial upon the three following grounds:—1. That if the plaintiffs' specifications are to read as embracing the defendants' or Remond's processes, the patents and specifications are respectively too wide, and the patents cannot be supported. 2. That if the patents are for the specific machinery described there was no evidence of infringement. 3. That the verdict was against the weight of the evidence. The arguments on this rule occupied the court a large portion of the above days.

Sir F. Thesiger, Mr. Grove, Q.C., Mr. Hindmarch, and Mr. Lush were heard for the plaintiffs; and Mr. Serjeant Byles, Mr. H. Hill, Q.C., Mr. Bovill, Q.C., and Mr. Webster for the defendants.

At the close of the argument Lord Campbell said, the court were of opinion that the rule ought to be discharged. He then went carefully through the various points in dispute, and the manufacturing processes, and afterwards pronounced judgment for the plaintiffs.

BOVILL'S PATENT FLOUR MILLS.

(*Same Court and Sittings as in the preceding case of De la Rue v. Dickenson.*)

SINCE the decision published in our No. 1720, for July 26, 1856, the validity of this case has been again tried, and judgment again given for the plaintiff.

VISCOUNT CARLINGFORD'S AERIAL MACHINE.

To the Editor of the Mechanics' Magazine.

SIR,—An article having appeared in your last Number respecting my aërial chariot, it may be well that I should enter more fully into the subject, for I have no doubt it will be considered of more importance after a little reflection than at the first moment, and will be found so very clear and simple, that the greatest wonder will be that it should have escaped the imagination of all the great scientific men the world has seen, for by a little observation the principle of it will be found to have presented itself daily to our view in various ways. Let any person take a newspaper and hold it to the wind from two points at one end; it will be found to rise up even above his hold. Let him look also at clothes hung out drying when there is wind, and the same effect is produced. Availing myself of the principle observed here, and having discovered the most perfect form of screw propeller, the matter became simple enough to me.

The idea first struck me at a scientific lecture ten or twelve years ago, at the Lowther Arcade, when I beheld for the first time an aërial screw start off; and I have expected every day since then to see the problem of flying, so long sought for and desired, duly carried out and perfected, and I resolved, at some time or other, if it was not done, to attempt it myself. I have now carried out my intention, and I am convinced I have succeeded. It may perhaps be improved by experience, as no doubt it will be, and also considerably enlarged to carry several persons. Once the principle is established, as I firmly believe it to be, experience will point out the precise position the wings ought to have, whether they should be placed a little more backward or a little more forward, and also the proper extent of wing or floating surface that will be found necessary for a particular weight, for I believe I have made the wings too extensive to carry only one person, but have done so that I may be rather beyond the mark than under it, for when once it has started the pressure of the air beneath will be so great, and the velocity so easily kept up, that what I have stated will be found quite evident. For instance, look to nature; the birds have merely the surface of their bodies to bear on the air, which also gives them a point to press on in the raising of their wings, over which my aërial chariot has the advantage, as the wings are stationary, while the aërial screw draws forward, and is fully supported all the time during its continued action, losing none of its impetus, and striking the air at the same angle as the bird, without any counter action, such as the bird is obliged to use in the raising of its wings, which is so much waste of power.

When we reflect, the idea of flying is not so very extraordinary. We look upon it as such, as we have all been brought up and impressed with the idea that it is impossible; so that a man fears being considered a fool even to entertain the subject, and if he is a professional man, he is at once apprehensive of losing his reputation as a man of science, and I believe that that has been the principal cause of clever men never giving up their minds to the subject. And then we may say that every thing can be

made to fly, that is, when a sufficient force is applied to it, and as long as that force acts on it the flight continues; and then what bears it up if it is not that force and the pressure it receives from the air on which it is borne? So that I say, the principle of my aërial chariot is most clear, simple, and evident, and I trust the scientific gentlemen will not still consider it beneath their notice, for they will only be injuring their reputation by doing so, as the plan and principle are now fully before them. And let them not lose time, for I trust very shortly to bring it before the eyes of all, so that whatever they say after this will not be listened to. No doubt they will discover that nothing was more easy and clear,—in fact, that any one might have done it. As in the case of the railways and many other things of our day, some of our scientific men have said, "Fly, and then I will believe it;" but a truly scientific man should first examine the principle, and one more clear than that of the aërial chariot could not be found. It is evident and convincing, and so it has been to two of our most scientific men, who have expressed themselves perfectly satisfied, and added, that they had not the slightest doubt on their minds but that it must fly. If, therefore, there are any who wish to question it, now is their time. Let them not wait until every person has seen the result, for they may then keep all they think to themselves. The plan and specification are now, or will in a very few days be, fully before them and the world, and I scarcely think that the scientific gentlemen or the press of the country will wait any longer to express their opinions either for or against it.

It is obvious why I did not first render it perfect and show that it could fly. That would have been simple enough; but had I done so, no doubt some clever person would have done as was attempted with the screw propeller I presented to the country; that is, come to see it, and before it was quite perfected, attempt to take a patent for it, and thus perhaps reap the benefit of this discovery. To prevent this, I have first taken out my patents, and now I am on the point of letting every person have an opportunity of seeing the result of my endeavours. Yet this will not be the first time. For the first chariot I made was at the Dublin Exhibition; yet, strange to say, although clear and simple as was the principle of it, it was not understood, nor even examined; but left in such an obscure position, that no doubt it was concluded to be some nonsensical production. Yet none were courageous enough to question the principle, or to approve of it, although challenged to do so. However, it was not perfected at that time, and the disbelief it met with was its protection, for which I am now most grateful, as I have had time to perfect it. And besides that, it implies more merit in the inventor, and has made me more proud than perhaps I should have been.

But what are to be the results of such a discovery? Who can tell? I believe they must be for good and for the happiness of the world. I communicated some time ago to a gentleman high in office under government, that I would open the ports of the continent to all light goods, and no doubt was thought not far from mad for having said so; but that is of no consequence. They have now an opportunity of judging if I had sufficient grounds for making that statement. But no doubt some will be clever enough still to perceive a little madness concealed under all this; for who but a madman could think he has discovered the art of flying? If there was anything of the balloon in it, or if the wings were filled with gas, although all they could contain would not hold up a five shilling piece, then indeed it might be conceived by some clever people. But, without gas, who could have any idea of the kind but a madman?

I may be pardoned for these remarks, as they are in reply to some wits who thought themselves very clever, and hoped to prove it by their silly jokes; yet I am aware that in the opinion of some, I am bringing forward a most monstrous principle. Be it so! but then let them leave their jokes aside and prove I am wrong if they can. I trust for the honour of the science of England there will be no hesitation about the matter, and that with one voice the press will admit the problem to be solved, as was admitted by M. Elie de Beaumont at the Academy of Sciences, Paris, as stated in your last Number.

I am, Sir, yours, &c.,
CARLINGFORD.

London, May, 1857.

WIRE ROPES.—Mr. Fowler, the inventor of Fowler's Steam Ploughing Apparatus, has patented an improvement in wire ropes to be used for ploughing and other purposes. He makes one of the wires in each strand of such ropes larger than the other, and this larger wire is made of steel; hence each strand of wire will have a spiral ridge around it, and when such strands are laid together, the projecting ridges of the strands which are outwards come against any surface on which the rope is moved, and the steel projecting wires receive the rub or friction, and thus protect the rope.

Remarks on Bringing the Sail Power of Ships, especially Screw Steam Ships, more under Mechanical Control. By H. D. P. Cunningham, Esq., R.N., Inventor of Cunningham's System of Reefing from the Deck; and containing a Letter from Captain J. O. Johnson, R.N., on the same subject. Portsea: W. Woodward and Son. 1857.

We have so frequently and so strongly urged upon ship-owners the merits of Mr. Cunningham's admirable invention for facilitating the working of ships, and for avoiding the loss of life attendant upon the old method of furling sails, that the appearance of a new edition of his *practical* treatise upon the subject does not require any lengthened remarks from us. The letter of Captain Johnson, R.N., published in this edition, is very strongly in favour of the invention, as applicable both to the mercantile marine and to the Royal Navy. There are now nearly *two thousand* vessels fitted with it, many of them large clipper ships, with topsail yards as large as those of line-of-battle ships; and experience has fully shown that, by means of Mr. Cunningham's improvements, "better passages are found to be made; fewer regular seamen are required in the crew; sails are found to last much longer; cordage is found to be saved; *ships have been saved;* and who knows how many poor fellows preserved from a watery grave?" These improvements have been adopted in several ships of the Imperial Navy by the French Government, and other Governments contemplate using it. The Aberdeen Clipper ship, *Imogene*, made the voyage from Algoa Bay in forty-seven days—the quickest passage on record—and the captain attributes the shortness of the voyage to the power the improved system gave him of carrying on a press of sail which he dare not have done with an ordinarily rigged ship, knowing that in an instant he could take the canvas off.

The system has many other advantages, which are enumerated in the treatise before us, and to this we refer our readers, in the hope that all of them who are directly concerned in shipping will obtain and read it. For our own part, we regard Mr. Cunningham's system as one of the most important inventions of late years.

PATENT WELDED-COLLAR IRON HURDLES.

We were invited, a few days since, by the managers of the St. Pancras Works, Old St. Pancras, to witness the operations of some novel machinery, designed for the more rapid manufacture of iron hurdles. The increased and increasing demand for iron hurdles, principally induced by the introduction of open-farming of late years, and the economy of such barriers both as permanent and moveable fences, appears to have induced the managers of these works to obviate all the existing objections to their use, and to produce them improved, at a price that should at once permit of their taking the place of the ordinary hurdles. The improvements consist in a simple but effectual mode of giving the greatest possible strength and rigidity to the whole of the horizontal bars and perpendicular supports. This is effected by welding on to the bars a circular nut or collar which, fitting with exactness on the one side or the other of the three upright supports, compensates for any strain which may be applied to any portion of the hurdle. In other words, the rods having these collars welded thereon at exact distances, are threaded alternately, and thus not only confine the two outside uprights in fixed immovable positions, but also render the centre upright—hitherto only a mere rest for the horizontal bars—not only a firm and rigid support, but an effective stay against the bending of the bars themselves under the weight of persons who may use them as stiles. These are obvious and valuable advantages, inasmuch as it is well known that even the ordinary iron hurdle will last a very long time, although it rapidly loses all its shape and fair proportions, while the patent welded-collar hurdles will keep symmetrical for a century or more, and in excellent condition if, once in three years or so, a coat of tar be applied to them. There is another advantage which this perfect rigidity affords: the junction of each hurdle with its fellow is most complete, and those gaps in the shape of acute angles, so often seen, despite the application of cords or wire ties, cannot be present to the eye of the landowner to whom order and fitness are objects of desire.

The machinery used to turn out these patent hurdles is worthy of especial remark; but, in the absence of illustrations, we could not do it justice. It may be, however, stated that the principles involved are the division of labour and an unerring exactness in all the several parts. It has been found, likewise, that the employment of the very best iron is an element of gain

in the manufacture of these hurdles, as, by its means, a saving of labour more than equal to any pecuniary advantage that would accrue from the use of an inferior metal results. We were informed that the increased demand for these hurdles had necessitated the erection of other premises, and that a plot of ground in Maiden-lane, Battle-bridge, would shortly be thus employed. It was evident, while watching the beautiful processes by which the miles of flat supports and enormous lengths of bars were being cut, welded, and rapidly converted into hurdles, that the exact duplicate character of every portion of them clearly suggests an additional recommendation to this mode of manufacture where the charge of shipment or land carriage is a consideration, as the bars and rods being all precisely similar, they might be conveyed in a small compass, and the little that is to be done in putting them together effected by any ordinary blacksmith upon their arrival at their destination.

MISCELLANEOUS INTELLIGENCE.

THE "GREAT EASTERN" STEAM-SHIP. At the dinner given to Mr. C. Manby, at Greenwich, on the 23rd of May, Mr. Scott Russell said he was proud of being the builder of the great ship, and should feel still prouder if she achieved the success he ventured to anticipate. The most remarkable feature connected with it was, that a body of men should be found who would subscribe £700,000 for an undertaking, the success of which was declared to be very problematical; that feeling would, however, be diminished when it was known that three-fourths of the shares in the undertaking were held by Members and Associates of the Institution of Civil Engineers. That fact alone spoke volumes for the safety of the structure. Mr. Brunel, who must be called the father of the project, had desired to have the smallest ship capable of taking its own fuel to Australia and back, and conveying such a cargo of goods and passengers as should be remunerative. Calculation showed the actual dimensions to be necessary, and the system of cellular construction adopted at the Britannia Bridge afforded the strength for these vastly increased proportions, which had at first surprised even English engineers, with their habit of regarding everything as possible. The size did not now, however, astonish even the merchants, who contemplated finding cargoes for her without trouble. It would be a proud day both for Mr. Brunel and for him, when the *Great Eastern* was committed to her proper element.

DENSITY OF COMETS.—Sir J. Herschel has pointed out the weakness of the absorption of the light of stars in traversing comets, and nearly all astronomers have observed that the nebulosity of comets does not sensibly weaken the light of the smallest stars when these were seen through their tails, or even through their nuclei. Pons, of Marseilles, ascertained that a star of the fifth magnitude, which was seen across the centre of the *Great Comet of the Bull*, on the 15th August, 1825, had undergone no sensible diminution of brilliancy. We know, also, that the light of stars in passing perpendicularly through the atmosphere loses more than one-fourth of its intensity. From these considerations, M. Babinet deduces the fact, that if the density of the air be represented by 1, that of a comet would be represented by a fraction of which the numerator is 1, and the denominator a number superior to unity followed by 125 cyphers! Sir John Herschel, in his last work on astronomy, mentioned a few ounces as the weight of the entire tail of a comet; but this estimate is enormously great when compared with M. Babinet's result.

THE STEAM CORVETTE "NIAGARA."—A naval correspondent writes as follows from Portsmouth, under date 7th June, respecting this singular ship:—"The *Niagara*," he says, "came into harbour this morning; and most warmly do I agree with the opinion expressed in your admirable article of last Saturday. She is, indeed, an unwieldy brute; and if you had seen the care and difficulty required to get her into Portsmouth Harbour to-day—and to get what into the harbour? a twelve-gun vessel!—you would have been delighted at having published such very sensible remarks." We have observed with satisfaction that the article alluded to by our correspondent has been quoted *in extenso* in several influential journals at home and abroad; and the *Times*, which on her arrival praised the *Niagara*, stated on Wednesday that she had been inspected by numbers of professional and amateur naval architects and naval men of all ranks, and added, "They all agree upon one point—the vessel's ugliness," thus confirming our statement upon that point.

METEOROLOGICAL INSTRUMENTS.—At a recent meeting of the Royal Institution, E. Vivian, Esq., M.A., exhibited a set of instruments which gave, approximately, the following results from one monthly observation:—The maximum and minimum temperature; the maximum, minimum, and mean humidity; the greatest influence, and the duration of sunshine; the amount and duration of rain. The principle of most of

these was founded upon the atmometer, with a combination of the wet and dry bulb and differential thermometers. By curves, exhibiting the fluctuations of the barometer, and the character of the weather, was shown how important it was to ascertain also the hygrometrical condition of the atmosphere, the barometer frequently rising before rains from the east. This diagram also proved how little influence the moon exerts, and the fallacy of the generally-received opinion that its changes determine the subsequent character of the weather.

Improved Ships' Masts.—It is well known that wooden masts soon decay about the head, and down to the hounds and the truss hoop, in consequence of lodgments of moisture at such parts, induced by the cap, the rigging, and the top. It is also well known that iron masts are objectionable, on account of their rigidity, the difficulty of cutting them away to save a ship, &c. Mr. J. Brown, a mast maker, of Liverpool, proposes to obviate these objections as follows:—He makes the top of the mast, from the cap to the truss hoop, in the form of a tube, of wrought iron, similar to an ordinary iron mast, and continues the metal downwards in the form of four tapered arms. The lower part of the mast is entirely of wood, and the upper end of it is fitted into the tube as far as the hounds, where it abuts against a strong iron cross plate formed in the tube. The tapered arms fit close to the wooden portion of the mast to which they are securely fixed by iron hoops, or otherwise.

The Original Locomotive Engine.—The Stockton and Darlington Railway, the earliest in the kingdom, having been opened in September, 1825, still possesses its first engine, now a rather antiquated looking piece of workmanship. Its weight is about eight tons; and that its speed cannot have been very great may be inferred from the fact that a race actually came off between it and a stage-coach. It is about to be placed on a pedestal in front of the Darlington railway station; and on Saturday a meeting was held on the proposed site, where, amidst music and the firing of cannon, Mr. Pease, M.P., laid the foundation-stone. The driver of the engine, who now lives in the neighbourhood of Darlington, was present, and had his portrait taken on the occasion. A dinner afterwards took place, after which addresses were delivered, and a letter was read from the venerable Mr. Edward Pease, the father of the Stockton and Darlington line, giving an account of this enterprise, and the immense development which the railway system has since undergone.

AERIAL NAVIGATION.

To the Editor of the Mechanics' Magazine.

Sir,—It is very evident that the power of endurance of your correspondent, Mr. Pitter, cannot be very great, when his favourite subject of paddle-wheel and Archimedean balloon is touched upon, even at his own invitation, since he at once forgets that which he states he is anxious to observe, namely, "the strictest rules of courtesy," and resorts to invective—the strongest proof he could give of a hopeless case. He says, among other things, that I presume "to reply to a whole series of four letters, having only read one." Now, I beg to say, I merely met with the one which my letter replied to, nor was I aware of the existence of any other. However, I have since seen the other three, and I find that my letter can be taken as a sufficient reply to them; but, as he does not think so, I trust he may be more pleased, when I have given my opinion on the only two novelties I can find in his other letters, which may be considered explanatory of the one alluded to, if letters written prior to it can be looked on as such. I allude to his proposing to cover his elongated balloon with a frame work, which should be put inside, otherwise it will be of no use, and which is, I presume, to be of wood, but perhaps of iron, which, I think, might do just as well, for I question whether the balloon would carry up one more than the other, particularly when the paddle wheels are attached, with their shifting cover, which, as your correspondent will no doubt admit, must be an additional demand upon their propelling force, if they should have any left after they have turned about the air contained in their cover, which must also be pressed forward against the wind, all by the small surface left uncovered. It is clear that the *Great Eastern*, now building, is the model upon which your correspondent has constructed *in his mind* his wonderful Archimedean and paddle-wheel balloon; and when he has proved that so much of his invention will rise from the ground, with his elongated balloon, it will then be time enough to inquire how the machinery of his Archimedean screw will be attached and raised from the ground with passengers and luggage, &c., &c., and the *balance* of all fully maintained, and the whole driven on against the wind. Your correspondent may now be satisfied with this full inquiry into his balloon navigation, but until the above queries are fully answered, and a trial of an elongated balloon attempted at least, I shall not notice any more letters on this balloon subject.

I am, Sir, yours, &c.,

An Amateur.

London, June 8th, 1857.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

[*Erratum.* The abstract of the specification, No. 2375, given at page 548 of our last number, should have appeared this week among the specifications of patents recently filed.]

WARD, P. *An improved composition for coating the bottoms of ships.* Dated Oct. 8, 1856. (No. 2359.)

The patentee prepares an earthy soap, thus: He makes an alkaline soap in the ordinary way from a caustic lye, fatty matter, and resin. When finished he draws off the spent lyes from the soap pan, and pumps into the pan as much solution of lime at about 30° of Twaddle as will decompose the alkaline soap. This earthy soap he transfers to an iron pan with a fire beneath, where it is heated until the whole of the water is separated. He then adds from 15 lbs. to 20 lbs. of oxide of copper previously dissolved in about 40 lbs. of resin to each cwt. of earthy soap, and boils them well together. In applying this as a coating to the bottoms of ships it is heated, mixed with some fatty matter or oil, and laid on with a brush.

WATSON, H., and J. DIXON. *Improvements in cocks and valves.* Dated Oct. 8, 1856. (No. 2360.)

This consists in arranging cocks and valves so that they may, when left free, gradually stop the passage of the water, and thus prevent waste without the injury to the pipes which results from the use of valves which close suddenly.

CLARK, W. S. *Improvements in the construction of churns for producing butter.* (A communication.) Dated Oct. 9, 1856. (No. 2363.)

This consists—1. In the construction of a churn vessel, with double concave or fluted side gatherers. 2. In the construction of a rotary reservoir dasher formed with concavo-convex or "ogee" sides, three or more in number; or a central tube and horn-like projections, or separate compartments. 3. In the double application of hot and cold water in combination with the dasher, or any modified shape or conformation thereof.

KING, T. *An improved continuous compressing machine.* Dated Oct. 9, 1856. (No. 2364.)

This consists in so arranging two endless perforated bands of articulated bars or links, that whilst each works round two drums placed at a distance apart, their faces shall be inclined to each other. Thus the space between the faces of the two is wedge-like, and materials placed between them will, when the bands are caused to move from the wide end toward the narrow end, be gradually compressed.

LONGDRIDGE, J. A., and T. RICHARDSON. *An improvement in constructing the fire-boxes of locomotive steam boilers.* Dated Oct. 9, 1856. (No. 2365.)

The front part of the fire-box is brought forward above the fire bars, so as to produce an internal shelf below the fire door but above the bars. The front of the fire-box is made double, as is that portion which constitutes the shelf. The fire door or front of the fire-box is perforated to supply air to the coal placed on the shelf. The coal is thus coked on the shelf before it is moved on to the bars.

COTTAM, G. H., and H. R. *An improvement in the manufacture of iron hurdles.* Dated Oct. 9, 1856. (No. 2366.)

The horizontal bars of hurdles are formed with shoulders, which come against the uprights, and give stability to the hurdle when finished. In making the feet of hurdles the projecting portions, in place of being welded to the uprights, and in place of passing through them, are fixed to the uprights by angular pieces riveted to the two. (See page 564.)

BURTON, C. *Improvements in machinery for washing and cleansing fabrics and cloths.* Dated Oct. 9, 1856. (No. 2367.)

A cylinder is mounted on axes on the ends, the axes at one end being somewhat out of the centre, to produce an eccentric motion. The interior surface of this roller is formed into longitudinal ribs of a curved form. On the interior of this cylinder is a roller of less diameter than the cylinder, and the external surface of this roller has corresponding ribs. The cylinder has doors which close fluid tight.

NAIRNE, W. *Certain improvements in the machinery for preparing flax, tow, and other fibrous substances.* Dated Oct. 9, 1856. (No. 2368.)

This consists in doing away with all star wheels, pitched chains, and spirals or screws used in giving motion to the gill bars or fallers, and whether gills are used or not. When the machine is used for roving, the patentee does away with the greater part of the machinery now used to equalise or regulate the motion of the spindles. The first is accomplished by giving motion to the fallers, by means of wipers. There are other combinations in the invention, but these cannot be described without engravings.

HOWELL, J. B. *Improvements in the manufacture of cast steel.* Dated Oct. 9, 1856. (No. 2369.)

This consists in using the scale which falls off steel or iron during hammering or rolling, in addition to the ingredients in common use for making cast steel.

SHAW, J. and E. *Certain improvements in pianofortes, organs, harmoniums, and other*

similar keyed musical instruments. Dated Oct. 9, 1856. (No. 2370.)

The object here is to procure two distinct sounds, a flat and a sharp, by the touch of each of the black or semitone keys of pianofortes, organs, harmoniums, &c. The invention comprises the use of certain mechanism, which consists of an arrangement of levers, in connection with a horizontal rod, upon which are secured stops or fingers which are brought against the tongues or reeds of either the sharps or flats when not required to sound, by means of a pedal actuated by the knees, hands, or feet.

JORDAN, L. J. *A medicine for the cure of venereal affections.* Dated Oct. 9, 1856. (No. 2371.)

To prepare this medicine the patentee uses sulphate of zinc, nitrate of potash, tragacanth powder, powdered henbane, tartrate of potash, bicarbonate of soda, and sugar.

HENDY, J. S. *Improvements in fire-stoves or grates used for domestic purposes.* Dated Oct. 9, 1856. (No. 2372.)

This mainly consists in adding to stoves a supplementary flue chamber at the back, which chamber has a contracted outlet, and is intended both to continue and improve the combustion.

LABAT, J. A. *Improvements in closing or stoppering bottles, jars, and other like vessels.* Dated Oct. 10, 1856. (No. 2373.)

This consists chiefly in making the metal screw threaded collar (patented 28th Sept., 1853), fixed in the neck of the bottle or other vessel, instead of being moveable, by casting it on the neck of the bottle.

JOHNSON, W. *Improvements in railway brakes.* (A communication.) Dated Oct. 10, 1856. (No. 2376.)

The brakes consist of metal bands or straps, fitted with friction blocks inside, which embrace a large friction drum keyed on to each of the axles, if requisite, of the carriages or waggons. The friction straps in each carriage are connected by levers with the same leather strap or chain wound on to a small drum placed between the axles carrying the friction drums, and supported by the main framing. The parts are operated by certain arrangements of rods, &c.

GATTY, F. A. *Certain improvements in dyeing.* Dated Oct. 10, 1856. (No. 2378.)

This consists in the use of nitrate of soda, sulphate of soda, chloride of sodium, sulphate of magnesia, sulphate of lime, and chloride of calcium, in dyeing cotton with logwood, and other dye woods.

McINNES, J. *An improved surface mineral coating for protecting iron and other substances, and an improved vehicle or varnish by which it is applied, and which varnish may be used with or without the addition of other substances.* Dated Oct. 10, 1856. (No. 2379.)

This consists in the use as a protective surface coating of emery, or corundum, when reduced to an impalpable powder, and which the patentee applies by means of any suitable varnish or vehicle.

RENNIE, W., jun. *Improvements in the condensing apparatus of steam engines.* Dated Oct. 10, 1856. (No. 2380.)

The condenser is placed at a considerable elevation, say 34 feet above the hot well, and the air being blown out of the pipes by the steam from the engine, the water from the hot well will be made to ascend in the discharge-pipe by the pressure of the atmosphere to the height of about 33 feet. The injection cock is now opened, the injection water flows into the condenser, and down the discharge pipe; the engine being then started, the exhaust steam is condensed, and a vacuum formed without an air pump.

McCONNELL, R., and A. MACKENZIE. *Improvements in supplying steam boilers with water, part of which improvements, or modifications thereof, are applicable for the transmission of fluids and the indication of fluid-levels under pressure.* Dated Oct. 10, 1856. (No. 2381.)

This invention consists of an apparatus comprising an annular chamber, a float, and a condensing arrangement operated by levers, &c., as the level of the water changes.

WATSON, W. C. *Improvements in sewing-machines.* Dated Oct. 11, 1856. (No. 2384.)

This consists—1. In an improvement in the method of constructing and operating the hook which takes up the loops formed beneath the table in single-thread sewing-machines. 2. In an improved feed motion.

SEITHEN, A. B. *Improvements in machinery or apparatus for cutting cork in the process of shaping and making stoppers of cork, and in the treatment of cork to be employed in the said processes, and to be applied to other useful purposes.* Dated Oct. 11, 1856. (No. 2385.)

These improvements consist—1. In veneer-cutting machines; and 2. In machines for cutting cork stoppers. It includes also methods of combining pieces of cork for stoppers, &c. For a full knowledge of the invention the specification must be consulted.

HEPPELL, G. *Improvements in ventilating mines and other like places.* Dated Oct. 11, 1856. (No. 2386.)

This relates to forcing air down the shaft of the mine, thence to be distributed to the various passages; also for withdrawing the impure air or gases from such places. It consists in forming the shaft with parallel sides, so that the cage may, by fitting tightly, serve as a bucket, such cage or bucket being provided with a suitable valve,

which, acting with a valve in the headway, becomes a means in the ascending motion of the cage of accumulating air in the shaft to be forced into the various passages of the mine by the descent of the cage; by reversing the valves the cage or bucket may be used for withdrawing the impure air or gases.

NEWTON, A. V. *A new gaseous liquid to be used in generating motive power.* (A communication.) Dated Oct. 11, 1856. (No. 2388.)

The object here is to produce a liquid compound that will facilitate the condensation of carbonic acid gas, render the vessels in which it is contained impervious to it, and at the same time act as a lubricator to all the parts it comes in contact with, and consists in the chemical union of bisulphuret of carbon, oil, and coal tar (stearine and elaine) to be used in combination with carbonic acid gas, liquified by cold and compression as a motive power.

VARNELL, G. W. *Improvements in mounting troughs, mangers, and apparatus used for feeding horses and other animals.* Dated Oct. 11, 1856. (No. 2389.)

When for the stall of the stable, the manger, the hay-rack, and the water vessel are formed with, or affixed to, the back of a short partition at the end of a stall, so that the partition, being capable of moving to and fro, and inclining forwards on its bottom or lower edge, will bring with it the manger, rack, and vessel into the stall of the stable beyond the upper part of the partition, so as to be accessible to the horse; but when the lower part of the partition is brought into an upright position, the manger, rack, and vessel will be behind the partition formed at the head of the stable, and the manger, rack, and vessel are not accessible to the horse, excepting at such intervals as may be fixed for feeding.

SCHEURMANN, G. *Improvements in printing music when type is employed.* Dated Oct. 11, 1856. (No. 2390.)

This has for its object so to construct types with the notes and musical signs thereon for the printing of music, and also so to combine lines and spaces as to admit of a page of music being set up in two forms in separate chases, one consisting of type with the notes and signs thereon, and the other consisting of full length lines, separated by moveable spaces in such manner that the same lines or rules may be used with different spaces, the impressions being taken in succession from the two forms.

ADOR, L., and E. ABBADIE. *Improvements in the manufacture of colours from metals, and in the furnaces or apparatus for the same.* Dated Oct. 11, 1856. (No. 2391.)

This consists—1. In the manufacture of colours by means of salts (chiefly oxide) of zinc, and certain other metallic salts. 2. In the arrangement of the apparatus and processes employed in this manufacture.

ELLIOTT, G. *Improvements in the production of oxides of manganese.* Dated Oct. 13, 1856. (No. 2392.)

This has for its object the production from the solutions of chloride of manganese arising from the manufacture of bleaching powder, or otherwise, of an oxide of manganese which can be employed for the purposes for which ordinary manganese is used, or which, by a subsequent treatment, can be converted into a hydrated peroxide of manganese. And this object is accomplished by various processes described.

TODD, W. and J. *Certain improvements in power-looms for weaving.* Dated Oct. 13, 1856. (No. 2394.)

These relate—1. To the tappet shaft of power looms, and consist in driving such shaft by means of a second shaft to which a rocking or reciprocating motion is imparted, and at each end of which shaft is a small pulley or drum, to which is attached an endless band or strap, which passes round, and is attached to a loose pulley upon the tappet shaft. This pulley has upon its rim a spring, pressing upon a pawl or catch, which acts against a plate secured upon the tappet shaft, and having ratchets or teeth; by this arrangement the rocking shaft imparts motion to the loose pulleys, which will cause the pawl to force round the ratchet, and give an intermittent motion to the tappet shaft as required. 2. To the rocking shaft, and consist in imparting to it an uniform reciprocating motion (by which a *dwell* is given to the healds) by means of a lever or arm indirectly connected with the crank shaft by an arrangement of levers.

PIATTI, G. B. *Improvements in the production of ice.* Dated Oct. 13, 1856. (No. 2397.)

The inventor causes gases to dilate in water. He also makes the sides of his apparatus double, and fills the space between with powdered charcoal, ashes, or other bad conductors of heat, which prevents caloric from passing into the apparatus to supply that absorbed from the water by the dilatation of the gases.

ROSCOW, J. *Certain improvements in machinery or apparatus for cutting or rasping dye woods.* Dated Oct. 13, 1856. (No. 2398.)

This relates to the instrument used for cutting, chipping, or rasping dye woods, and consists in a novel mode of constructing it, by dividing its front into three parts, and placing cutters in the central one only, &c.

STEPHEN, J. *Improvements in steam*

boilers and furnaces. Dated Oct. 13, 1856. (No. 2399.)

This relates chiefly to the boilers patented on the 20th of Feb., 1856, by D. Auld and J. Stephen. It consists in the formation of boilers with a narrow water space or pocket, extending from the underside of the boiler down through the furnace bars. The boiler is set slightly out of the horizontal line, the furnace end being the lower. Hence the deposit of the water is continually directed towards the furnace end, where it falls into the narrow bottom of the pocket. The pocket being below the bars, the heat cannot act injuriously upon the metal and burn it. The sediment can be removed either from the interior of the boiler, or through a plug way in the front end of the pocket end of the water space.

SUMNER, R. *Certain improvements in power looms for weaving.* Dated Oct. 14, 1856. (No. 2400.)

This invention is for producing devices upon a fabric during the weaving, and consists in mechanism for effecting the same by self-acting means. Apparatus at the two sides of the loom having been regulated as to the size of certain change and other wheels, and the slay set in motion, ratchet and other wheels commence to take up the fabric and throw off the pawl of the ratchet wheel, and the required number of picks are made at the various distances apart to produce the pattern.

KNOWLES, J., jun. *An improved apparatus for the prevention of accidents in winding from mines, which apparatus is also applicable for other similar purposes.* Dated Oct. 14, 1856. (No. 2401.)

A pair of lever-like arms is used for disconnecting the weight before reaching the winding pulley. These arms are contrived upon the same principle as the old self-opening clip used in pile-driving machines.

BREMNER, S. *Improvements in pouches or envelopes, and in machinery or apparatus for manufacturing or producing the same.* Dated Oct. 14, 1856. (No. 2402.)

This relates chiefly to apothecaries' envelopes. It is usual to print an ornamental design or advertisement on the front of such envelopes, and the improved form of envelope is particularly designed to give a desirable space for it. The flap may be printed upon both internally and externally, and the back also of the envelope affords additional space.

BROOMAN, R. A. *An improved method of, and composition for, splitting or rending rock, stone, and earth.* (A communication.) Dated Oct. 14, 1856. (No. 2403.)

This consists in splitting or rending rock, stone, and earth, by the introduction into holes made therein of a composition, of sulphur, saltpetre, sea-salt, sawdust, and dung, which, on being ignited, rapidly developes considerable heat, and so splits or rends the material in which it is deposited.

CRESSEY, T. S. *Improvements in machinery for cutting, hollowing, and backing staves.* Dated Oct. 14, 1856. (No. 2404.)

The wood for a stave is held on a carriage or bed, which is moved past a circular saw. The carriage has affixed to it a templet, which, pressing against the end of the saw spindle or axis, moves the circular saw progressively as the cut takes place. The carriage is guided by horizontal wheels at the front and back, which press against projections at the front and back of the bench on which it is moved. In hollowing and backing staves, a rotary barrel of a square section is employed, having a cutter affixed by preference at each of its four sides. On either side of this barrel, and parallel with it, are supporting rollers, the bearings of the axes of which are constantly pressed upwards by springs. Above each of the supporting rollers is a pressing cylinder grooved on its surface which moves forward the stave according to the form of cutters used. The pressing cylinders and a supporting roller are carried by a lever, and the position to which the lever is allowed to descend is governed by a cam surface.

COMPLETE SPECIFICATIONS FILED WITH APPLICATIONS.

WELLS, J. H. G. *Improvements in windlasses.* (A communication.) Dated Oct. 15, 1856. (No. 2407.)

This consists in giving to windlasses principally intended to weigh anchors threefold powers and continual motion, which powers can be used conjointly or separately. The first power is obtained by two balance beams connected by a rod or shaft supported in fixed bearings. To the rod or shaft are fixed two sets of articulated pieces fastened to a counterpoise vibrating on a centre. This counterpoise receives two catches, which, by the elevation and depression of the balance beams, and the action of the articulated pieces, give motion to a ratchet wheel mounted on the centre of an arbor, through which a shaft passes. Three safety catches are placed underneath the two catches to stop the ratchet wheel if one of the catches should break. The second power is obtained by two ratchet wheels mounted on the extremities of the arbor. In their centres the wheels are provided with grooves in which are engaged bent levers. Catches are attached to these levers, and gear into the ratchet wheels so that by elevating the levers the catches are made to descend in the ratchet wheels, and by depressing the levers a part revolution of the

arbor is effected. The third power is obtained by having at the lower end of the counterpoise an opening into which fits a a double lever which will assist the vibration of the counterpoise.

HEALEY, W. *Improvements in furnaces and boilers, and hot-water apparatus for heating purposes.* Dated Nov. 18, 1856. (No. 2720.)

This invention cannot be described without engravings.

DRAPER, E. D., and G. *New and useful improvements in oil-feeders, vessels, or cans for oiling machinery.* (Partly a communication.) Dated Dec. 4, 1856. (No. 2878.)

This invention consists mainly of improvements on the oil-can patented by the patentees 13th Aug., 1855. The objects are —1. To cause any oil which may run down the outside of the discharge pipe to run into the can or into the discharge pipe. 2. To vent the can so that the oil may flow freely from the discharge pipe. 3. To regulate or arrest the flow of the oil when the can remains inverted. 4. To so combine the air chamber and its inlet and outlet tubes with the screw cap of the vessel as to enable them to be removed together when the vessel is to be cleansed.

VIGNAT, L. *A new slide beater with one or more shuttles applicable to any loom whatever for weaving all kinds of tissues.* Dated Dec. 11, 1856. (No. 2933.)

The object is to obtain more regularity in the tissue, a larger amount of produce in the same time, economy in the workmanship, and a more beautiful manufacture. The invention cannot well be described without engravings.

WEST, D. *An improvement in presses constructed to operate by a combination of iron levers, which presses are employed to compress bales of cotton, hemp, wool, and other articles of merchandize.* Dated Dec. 22, 1856. (No. 3027.)

This consists of an improvement in presses acting by a combination of iron levers worked by a capstan and other machinery by manual labour, which improvement removes the capstan and other machinery, and substitutes hydraulic apparatus with chains, pulleys, and other appurtenances to work the levers of the presses by steam power.

MARESCHAL, J. H. E. *Improvements in hydraulic presses.* Dated Dec. 24, 1856. (No. 3056.)

This invention cannot be described without engravings.

ROSTAING, C. S. *Improvements in preparing and combining metallic substances for the production of colours, and in manufacturing the same.* Dated Dec. 26, 1856. (No. 3060.)

Oxide of zinc forms the foundation of the inventor's colours, and he has chosen blende, or native sulphuret of zinc, from which to obtain this oxide more or less pure. The process he employs in the preparation of these colours is based upon the property possessed by blende, or native sulphuret of zinc, of changing into oxide more or less pure, and in its amorphous state losing its sulphur when submitted to a proper roasting, in contact with air in reverberatory furnaces. The oxide of zinc which it contains is ordinarily diversely coloured by the oxides which were combined with the blende before the roasting process in the state of sulphurets.

WHITE, G. *An improved poultice.* (A communication.) Dated Dec. 27, 1856. (No. 3076.)

This poultice consists of amadon (agaric) in a more or less finely divided state, introduced in a thin bag.

THURTELL, W., jun. *Manufacturing cases of deposit for adhesive stamps, labels, or papers, so arranged that such adhesive papers in a moistened state are distinct and separate.* Dated Jan. 13, 1857. (No. 106.)

This consists in manufacturing cases of deposit for adhesive stamps, labels, or papers, so arranged internally that, by spontaneous evaporation, such stamps, labels, &c., are moistened, and kept moistened ready for use.

KITELEE, T. *An improved combination of ingredients to be employed as a breakfast-powder or article of diet.* Dated Jan. 21, 1857. (No. 180.)

This consists in combining ground malt with ground coffee or chicory, or with both coffee and chicory ground.

BURSTALL, T. *Certain improved machinery for manufacturing bricks and tiles from clay alone or mixed with other materials.* Dated Mar. 5, 1857. (No 647.)

This machinery cannot be described without engravings.

PHILCOX, G. *Improvements in marine and pocket chronometers and other timekeepers.* Dated Mar. 9, 1857. (No. 674.)

This consists of a particular train of wheels applicable only to the two-day marine chronometer and one-day pocket chronometer. Also a detent passing through from the back plate to the motion work, with a pinion fixed on a pivot to work in the minute wheel, in order to set the hands of the time-piece without opening the case.

DYAR, N. A. *A new and useful composition to be applied as a covering to the sides and roofs of buildings, and for various other purposes.* Dated Mar. 9, 1857. (No. 696.)

This consists in the employment of sulphuric acid for treating compositions containing hydro-carbons, the result being the

production of a composition having body, elasticity, and other properties fitting it for various purposes.

PIDDING, W. *Improvements in machinery or apparatus for the manufacture of piled fabrics, whether plain or figured.* Dated Mar. 16, 1857. (No. 735.)

This invention cannot be described without engravings.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

JOHNSON, W. *Improvements in the manufacture of fulminating powder.* (A communication.) Dated Oct. 10, 1856. (No. 2377.)

This consists in the employment of amorphous phosphorus, mixed either with salt of lead, baryta, strontium, soda, potass, tin, or zinc. The following proportions have been found to answer perfectly, namely, amorphous phosphorus, 88 parts; nitrate of lead (for example), 917. The several salts referred to, mixed with the fulminates of gold, silver, mercury, and other known fulminates, will also afford a good result.

ASHBURN, W. H., and J. FAIRHURST. *Improvements in machinery or apparatus used in the preparation of cotton or other fibrous substances for spinning.* Dated Oct. 11, 1856. (No. 2383.)

The granting of protection for this invention was delayed by the law officer.

LATHAM, J. *Registering the number of passengers by omnibuses and other vehicles and conveyances.* Dated Oct. 11, 1856. (No. 2387.)

This invention cannot be described without engravings.

JOHNS, C. S. *Improvements in machinery or apparatus for preparing pulp suitable for the manufacture of paper.* Dated Oct. 13, 1856. (No. 2393.)

One iron vessel is fitted within another, and within the inner vessel is an agitator. The outer vessel serves as a steam jacket in which the other is heated by high-pressure steam conveyed from a boiler, and which is exhausted by a pump. Straw or other material is placed within the inner vessel, which is then filled up with caustic alkaline liquor, and then closed. Steam flows between the vessels, and the alkaline liquor being under pressure absorbs heat until the desired temperature is attained.

KISCH, B. *An apparatus for containing an arrangement of cards or papers for selection.* (A communication.) Dated Oct. 13, 1856. (No. 2395.)

This consists in so arranging a series of cards or papers in sets, that upon the front one being removed, the next one may be brought forward to its place by springs, and so on until the whole set is withdrawn.

MONY, C. E. *An improved mode of transmitting motive power.* Dated Oct. 13, 1856. (No. 2396.)

This consists in making motive power act by intermediate gearing, or two wheels with an endless chain on toothed pinions on the shaft of which these wheels are fixed, the teeth of which take into the teeth of large wheels which serve as fly wheels, and for transmitting the power.

PALMER, J. *Improved machinery for separating different kinds of qualities of seed and grain from each other.* Dated Oct. 15, 1856. (No. 2412.)

The inventor proposes to apply to the well known cylindrical screen longitudinal partitions, of wire-work or pierced metal, and extending from the axle to the periphery. The use of these is to distribute the grain (as it is fed into the cylinder) over the inner periphery of the screen, and thus to bring into action an extended riddling surface.

LEFFLER, C. J. L. *Improved apparatus for the casting of metals.* Dated Oct. 16, 1856. (No. 2416.)

The object here is to insure the casting of solid ingots and other masses of metal, applicable chiefly to the casting of iron and steel manufactured under Bessemer's processes. The inventor proposes to run the metal into an iron tilting ladle lined with fire clay, mounted on an axle that forms a hinge for the ladle to turn upon. This axle runs through lugs formed near the pouring lip of the ladle. A cam is employed for lifting the ladle on its hinge, and pouring the molten metal into the moulds.

COMMANDEUR, J. *A mechanical apparatus for regenerating the impulsive force of any motive power.* Dated Oct. 17, 1856. (No. 2420.)

This consists of two upright cylinders formed of helical spires, between which heavy iron balls run, and by their weight cause the cylinder to oscillate on the pivot or axis.

PROVISIONAL PROTECTIONS.

Dated April 4, 1857.

950. John Henry Johnson, of Lincoln's-inn-fields, gentleman. Improvements in steam hammers. A communication from M. J. D. Farcot, of Paris.

Dated April 6, 1857.

958. Bartholomew Predavalle, of Great Russell-street, Bedford-square, civil engineer. A new motive power.

Dated April 7, 1857.

980. Henry Brierly, of Chorley, Lancaster, mechanical engineer. Improved mules or machinery to be used in spinning.

Dated April 13, 1857.

1046. Patrick McFarlane, of Comrie, Perth, N.B., agent. Improvements in looms for weaving.

Dated April 18, 1857.

1098. William Henry Dearing Granville, of Holborn-hill, gun manufacturer. Improvements in fire arms, and in the means of loading the same.

Dated April 23, 1857.

1142. Solomon Philipp Hecht, of Gresham-street, London. Improvements in the manufacture of moulds for making fancy tobacco pipes and other ornamental articles from plastic materials. A communication.

Dated May 6, 1857.

1285. Frederick Martin Schwab, of Carlisle-street, Middlesex, engineer. Improvements in breech-loading fire arms.

Dated May 9, 1857.

1307. William Glover, of Manchester, composer of music. Improvements in machinery for weaving.

1309. William Hebdon, of Weedon, Northampton, inspector. Testing the strength of woollen cloth, linen, and all other woven fabrics, also of every description of material upon which a strain can be exerted.

1311. William Player Miles, of Dartmouth-villas, Sydenham. An improved gauge cutting machine.

1313. Francis Watkins, of Smethwick, near Birmingham. Improvements in machinery for making rivets, bolts, and spikes. A communication.

1315. John Pym, of Pimlico, gentleman. Improvements in machinery to be employed on the water for raising and lowering weights.

Dated May 12, 1857.

1331. Edwin Cotterill, of Birmingham, manufacturer. A new or improved method of preventing the picking of ordinary locks and other fastenings.

1333. Rose Celestine Carbonino, of Paris. Improvements in nose bags.

1335. James Drysdale Malcolm, of Leicester-square. Improvements in the construction of buffing apparatus for railway engines and carriages.

1337. Thomas Lambert, of Short-street, New-cut, and Obed Wakefield, of Lambeth-terrace. Improvements in apparatus for drawing off water and other fluids.

1339. Richard Archibald Brooman, of 166, Fleet-street, London, E.C., patent agent. Improvements in the preparation of steel, and in the steeling or manufacture of tyres, shafts, axles, and other forgings. A communication.

1341. William Edward Newton, of Chancery-lane, civil engineer. Improvements in furnaces specially adapted to the generation of steam for motive power, but applicable to furnaces for other purposes. A communication.

1343. William Massey, of Newport, Salop, engineer. Improvements in engines for the cultivation of land by steam power.

Dated May 13, 1857.

1345. Stephen Yeldham, of Stamford-street, London. The better application and arrangement of indices to books of all kinds.

1347. Edward Eley, of Union-place, City-road. Improvements in the manufacture and application of pipes for heating purposes.

1349. Abraham FitzGibbon, of Canada. Improvements in the form of rails for use in railways and tramways.

1351. Richard Dugdale Kay, of Accrington, Lancaster, manufacturer. Improvements in machinery or apparatus for printing woven or felted fabrics. A communication.

1353. John Peak, of Wigan, Lancaster, manufacturing chemist. Improvements in the manufacture of gas.

1355. Joseph Fielding, of Ashton-under-Lyne, Lancaster, machinist. An improvement in apparatus applicable to steam pipes or cylinders used for heating and drying, which said apparatus may be similarly employed wherever steam is used for such purposes.

Dated May 14, 1857.

1359. William Sissons and Peter White, both of Kingston-upon-Hull. Improvements in steam-pile driving machinery.

1361. William Hyde and Joshua Hyde, vice makers, of Dudley, Worcester. Improvements in the construction of vices.

1363. George Crawford, of Edinburgh, music seller. Improvements in pianofortes.

1365. Edmund Hollingworth, of Weston Underwood, Derby, wheelwright. Improved machinery or apparatus for washing linen and other articles.

1367. Daniel Resding, of Claverdon, Warwick. A new or improved spring for carriages or other vehicles.

1369. Charles Bartholomew, of Rotherham, and John Heptinstall, of Masbro', York. Improvements in machinery for rolling tyres and hoops for railway and other wheels, and also other articles made of iron and steel.

Dated May 15, 1857.

1371. Michael Joseph Vanderborght, type founder, of Brussels. A new system of machinery producing simultaneously the three-fold effect of casting, breaking-off, and rubbing (smoothing) of printing characters.

1373. Frederic Whitaker, of Islington. Improvements in the construction of machinery for sewing and embroidering.

1375. Isaac Whitesmith and William Whitesmith, of Glasgow, machinists. Improvements in weaving.

1377. David Carter, of Honley, near Huddersfield, machine maker. Improvements in machinery or apparatus for cleansing the waste of woollen or other fibrous manufactures, or for recovering the wool or other fibres from such waste substances or materials.

1379. Sophia Sands, of Nottingham, widow. Improvements in the manufacture of fringes. A communication from R. Sands.

1381. Richard Archibald Brooman, of 166, Fleet-street, London, E. C., patent agent. An improvement in the construction of oil cans. A communication.

1383. Francis Parker, of Homerton, gentleman. An improved tell-tale for public vehicles.

Dated May 16, 1857.

1385. Charles William Ramié, of Camberwell. A mode of attaching handles to table cutlery.

1387. Henry Trappes, of Manchester, gentleman. An improvement in the construction of a sliding drawer, applicable to all steam engines, either fixed or locomotive, for the distribution of steam, aeriform, or liquids, used either as a motive power or for any industrial or artistic purpose. A communication.

1389. Joseph Ellis, of Port Hope, Canada, civil engineer. Improvements in the manufacture of artificial stone.

1391. Nathaniel Ogle, of Jersey, Esquire. An improved method of propelling and ventilating ships.

1393. Richard Bradly and William Craven, of Wakefield, engineers. Improvements in machinery or apparatus for making bricks and tiles.

Dated May 18, 1857.

1395. John Avery, of Essex-street, Strand. Improvements in mills for grinding corn and other like substances. A communication from J. Perrigault, of France.

1397. William Edward Newton, of Chancery-lane, civil engineer. Improvements in the manufacture of boots, shoes, and other coverings for the feet. A communication.

1399. William Clark, of Chancery-lane, engineer. Improvements in the manufacture of silk, and in the machinery used therein. A communication.

Dated May 19, 1857.

1401. John Carnaby, of Snow-hill, London, gas apparatus maker. An improved registering index for gas and other meters.

1405. Julius Friedrich Philipp Ludwig Von Sparre, of Eisleben, Prussia, engineer. Improvements in separating substances of different specific gravities, and in the machinery and apparatuses employed therein.

1407. William Whitehead, of Huddersfield, manufacturer. Improvements in cards for Jacquard mechanism.

1411. Louis Cornides, of Trafalgar-square, Charing-cross. Improvements in the manufacture of gelatine and glue.

Dated May 20, 1857.

1413. John Hardey, of Shide, Isle of Wight, gentleman. An improved apparatus for bruising and grinding vegetable substances.

1417. Henry Keogh, officer, of Hugh-street, London, and Ffrench Augustus Keogh, of Inner Temple, London, solicitor. Lighting the public gas lamps in the cities and towns of Great Britain and Ireland by electricity and for turning off and on the gas to same simultaneously.

1421. Elijah Aldis, of Manchester. Improvements in cramps for flooring and other purposes.

1423. James Abbot, jun., of Bilston, millwright, Richard Handley Thomas, of Kidsgrove, engineer, John Young, of Bilston, Roll Turner, and James Edward Hunt, of Highfields, near Bilston, agent, all in Staffordshire. Improved machinery for blooming iron.

1425. James Honiball Tozer, of Liverpool. Improvements applicable to travelling caps and other coverings for the head.

1427. William Clark, of Chancery-lane, engineer. Improvements in the preparation of the colouring matter, called murexide. A communication.

1429. Edward Curtis Kemp, of Birmingham, agent. Improvements in unions for gas pipes and other pipes or tubes. A communication.

Dated May 21, 1857.

1431. Peter Armand Lecomte de Fontainemoreau, of London. Certain improvements in the processes for detaching or separating calcareous rocks. A communication.

1433. William Blacklidge, jun., of Hoghton, Lancaster, accountant, and George Read, of Bolton-le-Moors, millwright. Certain improvements in the construction of churns, which said improvements are also applicable to other agitating or stirring apparatus.

1435. William Foster, of Black Dike Mills, Bradford, York, spinner. Improvements in the making of worsted and woollen yarn.

1437. William Edward Newton, of Chancery-lane, civil engineer. An improved method of sewing or stitching fabrics together. A communication.

Dated May 22, 1857.

1439. John George Taylor, of Glasgow, merchant. Improvements in writing materials.

1441. Christophe Muratori, of Rue Lafitte, Paris, doctor of medicine. Obtaining a new sort of white by silicate of magnesia and oxide of zinc, or by silicate of magnesia and carbonate of lead, in the first case a composition of zinc, and in the second a composition of lead.

1445. Perceval Moses Parsons, of Duke-street, Adelphi, civil engineer. Improvements in making moulds for casting railway chairs and other articles in metal, and in apparatus for that purpose.

1447. Frederick Walton, of Wolverhampton, manufacturer, and John Pinson, of Wolverhampton, machinist. New or improved machinery for stamping or raising metals.

1451. Peter Effertz, of Nelson-square, Blackfriars-road. Improvements in machinery for making bricks.

Dated May 23, 1857.

1453. William Carron, of Birmingham, machinist. A new or improved nail, spike, or bolt, and machinery for manufacturing the same.

1455. Pascal Florentin Coulon, of Rue de l'Echiquier, Paris, gentleman. Certain improvements in velveting paper and textile fabrics.

1457. John Rankin, of Manchester, tin-plate-worker. Improvements in ventilators.

1459. Thomas Silver, of Philadelphia, U.S., gentleman. An improved steam-engine governor.

1461. John Phillips, of Clipston-street, Middlesex, engineer. Improved apparatus for supporting and propelling the human body in water.

Dated May 25, 1857.

1463. Walter James Handscombe Rodd, of Earl's-court, Westminster. A method of sailing or propelling a vessel or vessels out of or on the surface of the water.

1465. Schofield Crowther Sheard and George Underwood, millwrights, &c., of Smethwick, near Birmingham. Certain improvements in supplying boilers with water, generating steam, and consuming smoke, and which said improvements are applicable to marine, locomotive, stationary, and other boilers.

1469. Nicolaus Charles Szerelmey, of Bath-road, Peckham, Esquire. Improvements in preparing combinations of materials for coating wooden and iron ships or vessels.

1471. William Fox, of Boulogne-sur-mer, France. Improvements in the manufacture of steel pens.

1473. Henry Cogan, of Trent, Somerset, farmer. An improved adjustable connection or joint, particularly applicable to agricultural implements.

1475. Marin Joseph Alphonse Mille, of Paris, miner. Improvements in producing gas.

1477. Louis Désiré Aubert, of Paris, mechanician. Improvements in fastenings for securing rails in the chairs.

1479. William Edward Newton, of Chancery-lane, civil engineer. An improved mode of relieving the slide valves of steam engines from unnecessary pressure. A communication.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," June 9th, 1857.)

238. W. A. Turner. Improvements in the manufacture of starch.

260. C. E. Symonds. Improvements in the manufacture of oxide of lead and its salts.

262. A. Malins. A new or improved method of ornamenting castors for furniture, lamps, chandeliers, cornices and cornice ends, curtain bands and curtain pins.

264. S. Jay and G. Smith. An improved hood or covering for the head capable of being used either separate from or in combination with other garments, such as cloaks, mantles, capes, dress-

ing-gowns, and other entire or partial coverings for the human body.

265. C. de Bussy. The reduction of zinc ores.

270. J. T. Pitman. An improvement of the letter organization of the instrumental music scale. A communication.

282. H. Smith. Certain improvements in window price-tickets, and which said improvements are also applicable to the ornamenting and prising the wrappers or paper boxes for holding fancy and other goods, also in the mode of attaching or suspending window-tickets.

288. D. Morrison. A new or improved manufacture of ordnance.

298. C. Symonds. Improvements in ships' night signals.

302. B. Hodgson and J. Carter. Improvements in apparatus for introducing the pile wires used in weaving Brussels carpets and other piled fabrics.

305. R. Morrison. Improvements in steam boilers.

307. T. W. Raynor. Improvements in cocks and valves.

316. J. Bernard. Improvements in fastenings for uniting wood, metal, cloth, leather, and other materials.

323. S. Hart. Improvements in apparatus for raising and forcing water.

324. C. de Bergue. Improvements in the method of, or apparatus for, laying the permanent way of railways.

359. W. Green. Improvements in manufacturing or producing substitutes for leather for boots, shoes, and other uses, and in machinery or apparatus for effecting the same.

373. J. Harding. Improvements in the treatment of metallic ores.

391. W. W. Pilcher. Improvements in straw-shakers of thrashing-machines.

397. J. T. Pitman. Improvements in the mode of making metallic hames for horses. A communication.

447. W. R. Jackson. An improved railway-break.

455. W. Clark. Improvements in the manufacture of railway chairs. A communication.

458. C. Cowper. Improvements in making drains, and in machinery for that purpose. A communication.

465. J. B. Pascal. An improved engine with rotary piston, applicable to various purposes.

489. W. Clark. Improvements in the manufacture of sheet glass. A communication.

528. J. Kirkham. Improvements in the construction of furnaces, ovens, or kilns, for drying, baking, or burning pottery or earthenware, bricks, tiles, or other similar articles; and in the means of collecting and condensing or carrying off the smoke, gases, or vapours evolved from such or other furnaces or fire-places, or that escape or arise from the retorts and other parts of the apparatus used in the manufacture of gas.

580. C. H. Murray. An improved construction of chain-pump.

585. J. Milnes and W. Thompson. Improvements in looms for weaving.

685. C. C. Dennett. A new construction of floors and ceilings of buildings.

732. H. Bradley and E. Wray. Improvements in beaters used in thrashing-machines.

807. H. Dolby and E. T. Dolby. Improvements in machinery used when printing several colours in succession on the same surface.

923. W. H. Box. An improved fish-hook.

958. B. Predavalle. A new motive power.

1064. L. Barnett. Improvements in the making and cutting-out of garments.

1101. H. Heald. An improved method of packing pickers employed in looms.

1254. J. Howard, jun., and W. Howard. Improved apparatus for the manufacture of cheese.

1260. J. A. Petiet. Improvements in actuating railway-breaks.

1345. S. Yeldham. The better application and arrangement of indices to books of all kinds.

1350. R. S. Newall. Improvements in the manufacture of wire strands for electrical purposes.

1393. R. Bradley and W. Craven. Improvements in machinery or apparatus for making bricks and tiles.

1397. W. E. Newton. Improvements in the manufacture of boots, shoes, and other coverings for the feet. A communication.

1407. W. Whitehead. Improvements in cards for Jacquard mechanism.

1413. J. Hardley. An improved apparatus for bruising and grinding vegetable substances.

1437. W. E. Newton. An improved method of sewing or stitching fabrics together. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1262. John Wilson.
1270. Thomas Richardson.
1279. Julian Bernard.
1288. John Young.
1448. John Kolbe Milne.

LIST OF SEALED PATENTS.

Sealed June 5, 1857.

2885. Robert Davison and Joshua Crowther.
2892. Heth Ogden and Henry Hibbert.
2896. Christian Schiele.
2902. John Leslie.
2910 Robert Frederick Miller.
2911. Edward Burwell
2927. Alexander Macarthur.
3052. William Macpherson.
3078. Thomas Shaw.
102. George Eskholme and Henry Wilkes.
103. Richard Chrimes.
207. George Eskholme and Henry Wilkes.
240. George Tomlinson Bousfield.
758. Thomas Yarrow.
945. Richard Birkin, jun., and Thomas Isaac Birkin.

Sealed June 9, 1857.

2920. Joseph Walton.
2926. William Storey and Thomas Storey.
2931. Jacob Green.
2932. Joseph Chatwin.
2940. William Lund.
2945. Charles Humfrey.
2946. Henry King.
2993. Godwin Meade Pratt Swift Viscount Carlingford.
3011. John Murdoch.
3023. William James Payne.
3037. Joseph Sharp Bailey.
3081. William Swain.
3093. William Edward Newton.
77. John Henry Johnson.
137. George Tomlinson Bousfield.
291. William Edward Newton.
365. Perceval Moses Parsons.
459. John Goodman.

541. Alexander Parkes.
771. Samuel Campbell.
789. William Johnson,
883. Antoine Joseph Quinche.
983. Jean François Victor Larnaudès.
991. Alfred Vincent Newton.
1061. Henry Willis.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

The following papers are ready for publication, and will appear as soon as space can be afforded them, viz., Mr. Armstrong's on "Steam-ship Arithmetic," Dr. F. Halle's on "Algebraical Equations," Count Reichenbach's on "Aërial Navigation," together with several editorial articles.

J. Sutcliffe.—We do not understand the suggestion contained in your letter on surface condensation.

J. A. D.—Your suggestion respecting tables for sea use shall appear. The gutta percha tyre-bands are not new.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris: Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin: W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1767.] SATURDAY, JUNE 20, 1857. [Price 3d.

Edited by R. A. Brooman, 166, Fleet-street.

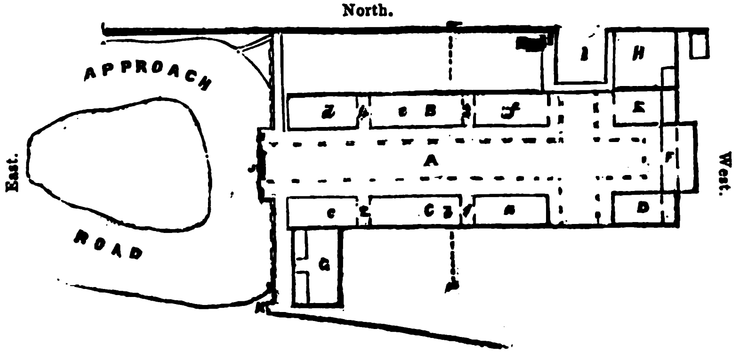
THE MANCHESTER ART TREASURES EXHIBITION BUILDING.

Façade.

Transverse Section, on line a a.

Plan.

North.



South.

THE MANCHESTER ART TREASURES EXHIBITION BUILDING.

As the erection of exhibition buildings is becoming very general, a description of the edifice recently erected at Manchester will doubtless be acceptable to our readers both at home and abroad. The idea of holding an Exhibition of Art Treasures at Manchester during the present year originated with Mr. J. C. Deane, the General Commissioner, by whom it was communicated to Mr. Thomas Fairbairn, Mr. Ashton, and the Town Clerk, Mr. Joseph Heron. As soon as the scheme had assumed a tangible shape, it was submitted by these gentlemen to a private meeting held at the Town Hall, on the 26th March, 1856, when it was unanimously agreed that the proposal should be carried into execution, and a guarantee fund, amounting to £70,000, was immediately entered upon for the purpose of providing adequate means for carrying on the undertaking, and the patronage of Her Majesty the Queen and H. R. H. Prince Albert was solicited and obtained. Subsequently, at a meeting held on the 20th of May, the following gentlemen were appointed to form an executive committee, viz., Messrs. Watts (Mayor), T. Fairbairn (Chairman), Ashton, Entwistle, Heron, Potter, and Sterne. On these devolved the anxious and arduous responsibility of carrying out the undertaking, the choice of a suitable site, and the selection of the plan of the building. Many situations presented themselves; but the ground at Old Trafford, formerly occupied by the Manchester Cricket Club, and which is situated between the Botanic Gardens and the Altrincham and South Junction Railway, was chosen. The plans sent in by Messrs. C. D. Young and Co., of London, were, after mature deliberation, accepted with some modifications. These plans were for a spacious building of iron, wood, and glass (with façade of red and yellow brick), the design being by Mr. William Dredge, C.E., who was acting as engineer for Messrs. Young and Co., and who likewise superintended its erection. The façade was designed by Mr. Edward Salomons, architect to the Executive Committee.

On the 18th of August, the first base of a column was laid by Mr. Fairbairn, the chairman, on which occasion Mr. J. D. Young presented him with the silver trowel used at the ceremonial. From this time the work proceeded with great despatch, and during the first week after the base was laid, not less than 1,200 tons of material were placed on the ground. Altogether, not less than 1,400 tons of iron and 125,000 cubic feet of timber, and 2,500,000 bricks, were used in the construction of the building. The building was nearly finished by the 18th of February last, when it was thrown open for a promenade, and about 6,000 season ticket-holders and their friends attended.

The following are its principal details:

Length of Building, 704 feet.
Breadth ditto 200 feet.

GREAT HALL.
Length, 632 feet; entire width, 104 feet.
Width of nave, 56 feet; ditto of side aisles, 24 feet.
Height of centre, 56 feet 6 inches; do do 31 feet 6 inches.

PICTURE GALLERY.
Length of each gallery, 432 feet; width, 48 feet.
Length of *a*, *c*, *d*, and *f* Saloons (p. 577), 120 feet; do of *b* and *e*, 144 feet.
Height, 50 feet 6 inches.

TRANSEPT.
Length of north and south, 200 feet; width, 104 feet.
Height, 56 feet 6 inches.
Oriental Court, 72 feet by 48 feet. Hertford Gallery, 72 feet by 48 feet.

WATER-COLOUR GALLERY.
Principal Gallery, 200 feet by 24 feet.
Small do 52 feet by 24 feet.
The length of galleries round building, 800 feet by 24 feet.

The plan of the main building is rectangular, 656 feet long by 200 feet broad, and is divided longitudinally into a central hall, marked A in plan (p. 577), and two picture galleries, B and C, one on each side, 48 feet wide.* A transept, similar to the central hall, crosses the building (as is shown in the plan) at 148 feet from the west end. The central hall is prolonged 24 feet on each side, making the total length of the building 704 feet. The principal façade faces the east, and is of brick, 440 feet long. It contains Her Majesty's apartments, offices, &c., &c. 200 feet of the central part of the façade (shown in elevation, p. 577) form the ends of the main building, the south wing being a corridor approaching from the railway station, whilst the north wing contains cellars and stores connected with the refreshment department. The west end is also of brick, and contains the Water Colour

* The plan view has been accidentally reversed on the block on the preceding page. But the four faces have been marked east, west, north, and south to prevent mistake.

Gallery, F, 200 feet by 24 feet, and two smaller rooms. Between the Water Colour Gallery and the transept on the north side is the Oriental Court, E, and symmetrically with it on the south side the Hertford Gallery, D. A gallery, 24 feet wide, supported on columns

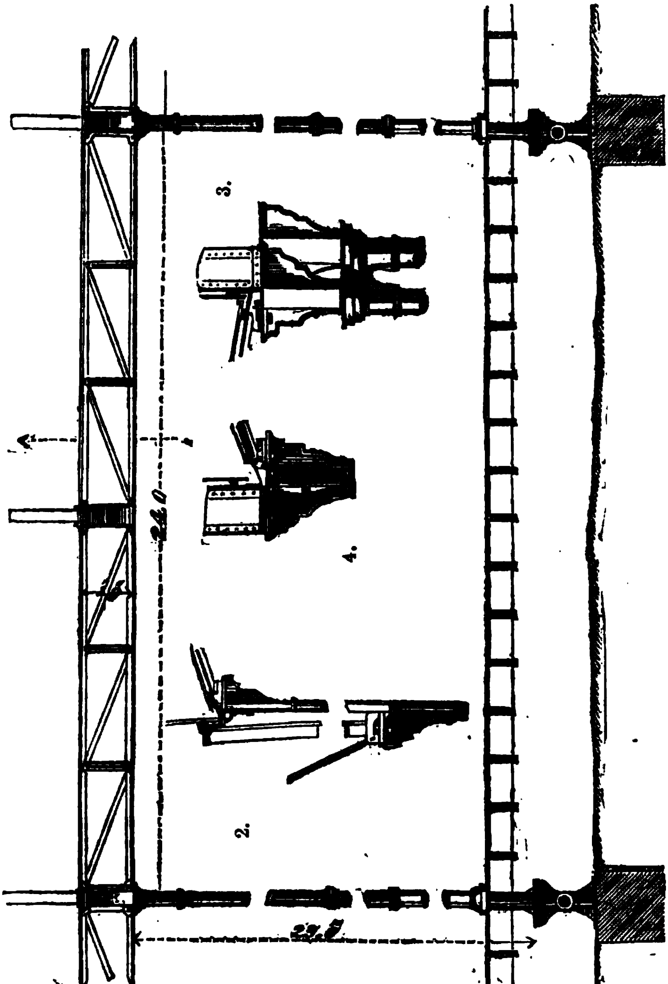


Fig. 1.

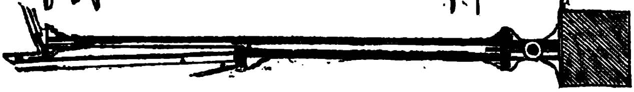


Fig. 5.

Fig. 6.

15 feet high, and commencing 72 feet from the end of the transept, surrounds the transept and west end of the building. On the north of the transept is a cloistered court I, which

leads into the first class refreshment rooms, 72 feet by 90 feet, marked H on the plan, and the second class refreshment room, G, is situated on the south side of the building, adjoining the railway corridor. The railway station is on the south side of the building, the length of platform being 800 feet, 400 feet of which is covered with an angular roof 24 feet wide. The road approach is laid out as shown in the plan, and the main entrance to the building is marked J thereon. A main drain, 12 feet deep, surrounds the building, and communicates with a sewer in the railway, which falls into the Irwell about a mile distant.

The foundations were all sunk to the level of the blue clay, which averaged about 2 feet 6 inches below the surface; those on the east and west fronts were trenched out and built up of brick work, the east front of red and white brick (shown in the elevation), and the west end of common brick work. Along the side walls down the whole length of the building pits were dug, 8 feet apart, 2 feet 6 inches by 2 feet 6 inches; and to the blue clay similar pits were also dug, but 12 feet apart, along the partition, dividing the main hall from the picture galleries; also below the columns supporting the main hall similar pits, but considerably larger, were excavated.

Sleeper walls, 4½ inches thick, with 9 inch piers every 1 foot 6 inches were placed across the building 12 feet apart from centre to centre. Spruce batten joists, 7 inches by 2½ inches, rest on the sleeper walls, and 1½ inch spruce flooring boards are spiked to the joists, leaving a space between them of ¼ inch or thereabouts. Cast iron base plates (figs. 1, 5, and 6), set in fine mortar, are placed upon the faces of the brick piers, both along the walls of the building and within the area inclosed by the walls. On the outside rows standards of cast iron, 24 feet long, H shaped, are set upon the base plates, and bolted to them at the bottom, the top of the standards being flanged to support the eaves gutters. The standards are put 8 feet apart, but the principals are 12 feet asunder. Every second principal is, therefore, supported by a cast iron girder, which connects the adjoining standards together at the top. A moulded eaves gutter rests on the standards, and is bolted to them. The spaces between the cast standards on the outside walls are filled in with corrugated sheets, No. 18, B. W. G., the corrugations lying horizontally, and are secured to the grooves of standards by oak wedges, and the walls inside are lined with ¾ inch spruce boarding. Similar standards to those just described are bolted to the base plates, dividing the Great Hall from the Picture Galleries, and are bracketed at the top, as shown in figs. 5 and 6 (and on a larger scale in fig. 2), to support principals. The spaces between these standards are filled in with ¾ inch boarding. The roof which covers the Picture Galleries is semicircular, 48 feet span, and of course rises 24 feet. The principal rafters are of T iron, 4 inches by 4 inches by ½ inch; the tie bars rise very acutely, approaching the crown of the roof to within about 6 feet. This adds greatly to the beauty of the building, as it takes away entirely the shed appearance usual to iron roofs. The main roof of the Central Hall is 56 feet span, and is a plate girder, the top and bottom flanges of T iron and the web of plate, and of the elevation shown in the transverse section (p. 577). The roof girders are 12 feet apart, and rest alternately upon the columns in the great hall, and upon wrought iron lattice girders which connect the columns together longitudinally. The lattice girders are shown in elevation, fig. 1, and in section in fig. 4. The columns are coupled (as in fig. 3), and each is 7 inches in diameter. The space between the nave of the Great Hall and the Picture Galleries is 24 feet, and covered with an angular roof, also of iron. All the roofs are covered with corrugated sheet iron, No. 20, B. W. G. They are lighted from the top; one third of the space being glazed with 21 ounce glass. The construction of the transept is precisely the same, and of the same dimensions as the Great Hall; the girders at the groin, at the intersection of it with the Great Hall, are constructed on the same principle, and projected to the curve produced by the intersection of the two semi-circles, full-sized templates having been made for that purpose.

The square courts beyond the transept, marked the Oriental Court and Hertford Gallery, are each covered with angular roofs, supported by intermediate columns, of 5 inches diameter. The construction of these roofs is the same as those shown in transverse section for the side aisles. Both these last courts lead in to the principal Water Colour Gallery, which is a brick building 200 feet by 24 feet, with a semi-circular roof of T iron, 4 inches by 4 inches by ½ inch, without any ties whatever. This, as well as the small rooms behind, which are also of brick, with roofs like the side aisles and Oriental Court, is lighted from the roof in the same proportion as the rest of the building. The transept ends are glazed from floor to roof, the semicircular end being filled in with ornamental iron work and glass. From the north end of the transept there is an approach to the first class refreshment room, by way of a cloistered court which surrounds three sides of the square, the remaining side forming an appropriate entrance to the Botanical Gardens, which must prove an immense relief to the building, when overcrowded with visitors.

The refreshment rooms of both first and second class are constructed on the same principle as the rest of the building, and call for no particular remark. The walls are of corrugated sheets, with cast iron standards, and they are covered with ridge and furrow roofs lighted from above. The whole of the rain water which descends on the roof, flows into gutters in the ridges and eaves, and down the columns into the drain pipes of cast iron, which connect the base plates together, whence it flows into the sewer already spoken of. The whole of the outside of the building is painted with three coats of oil paint, and is finished a light stone colour.

Such are the general features of the construction of this building, the designing and execution of which are very creditable to the professional reputation of Mr. Dredge, and prove that his studies and practice as an architectural engineer have been well supplemented by the erection of this great and novel structure. If any further details should appear to us to require publication, we will give them in a future number.

IRON AND STEEL.

(*Concluded from p. 536.*)

Now, suspecting less from such evidences or suggestions as theirs than from the facts to be observed on conversion (such as that of the singular influence of cyanogen compounds), the substantial and invariable existence of nitrogen in steel, the writer proceeded to arrive at that point as follows: The best malleable iron on the one hand, and by way of comparison with this, the same kind of iron fully converted by the usual process, were taken on trial; the steel was dissolved in very dilute and pure hydrochloric acid, and the carbonaceous flocculent matter that was left collected, carefully dried, and analysed. The iron was treated in the same manner, and the comparatively very small proportion of carbonaceous residue given by it also examined. And these were compared with the residue obtained also from cast-iron. Effecting the combustion of each of the residues by aid of the soda-lime process, in the usual manner, the following results were obtained:—1. The residue from the malleable iron contained no nitrogen whatever. 2. That from the cast-iron always showed the presence of nitrogen, but in very minute and in variable quantities; an average of results would seem to confirm the analysis of Marchand. 3. In the steel residue there was invariably detected a considerable quantity of nitrogen. The analysis of this carbonaceous residue gave $C = 0{\cdot}63$, $N = 0{\cdot}24$; impurities, $0{\cdot}13 = 100$. The direct analysis of this sample of steel, using the soda-lime process, gave in 100 parts of steel $C = 0{\cdot}68$, $N = 0{\cdot}19$; that is, every 100 parts of steel contained about $\frac{1}{5}$th per cent. of nitrogen associated with about three times its weight of carbon. The proportion of nitrogen in the residue was greater than in the steel itself,—a result proved afterwards to be due to the absorption of nitrogen or the formation of ammonia in the act of drying the residue. The direct analysis of the malleable iron gave no nitrogen whatever—that of the cast-iron only a trace. This steel contains therefore about $\frac{1}{5}$th per cent. of nitrogen, and by other trials good steel always gives about this quantity, but inferior steel much less. It is obvious that the residue is an azotised carbon, out of which fact arise some important considerations. But confining these, for the present, to the cases of the malleable iron and the steel, it would appear that the difference in chemical composition between these two is not less remarkable than the difference between their respective physical properties; but in what precise manner these two elements, carbon and nitrogen, produce these differences, or the form in which they exist together in the steel, we can only as yet conjecture theoretically.

After detailing various synthetical evidences, the author concluded that one fact is ever apparent, namely, the invariable cooperation of both nitrogen and carbon wherever the result is the production of steel.

The conclusions that to the writer appear to be warranted by the previous evidences are:

That the substances whose application to pure iron convert it into steel, all contain nitrogen and carbon, or nitrogen has access to the iron during the operation.

That carbon alone added or applied to pure iron does not convert it into steel.

That nitrogen alone so added or applied does not produce steel; but that

It is essential that both nitrogen and carbon should be present, and that no case can be adduced of conversion in which both these elements are not present and in contact with the iron.

That nitrogen as well as carbon exists substantially in steel after its conversion; and such presence is the real cause of the distinctive physical properties of steel and of iron, in which latter these elements do not exist.

That presumptively, but not demonstratively, the form of combination is not that of cyanogen (though that compound plays so important a part in conversion), but is that of a triple alloy of iron, carbon, and nitrogen.

That experimental research is yet required to determine the relative proportions of the elements when their union gives pure steel.

We possess other evidence of the use of nitrogen from another and unexpected quarter; it is on record as a practice of the Indian "Wootz" steelmaker that, along with his iron or imperfect steel in his melting crucible he places as his carbon-giving material the wood of the *Cassia auriculata*, and covers the whole with the leaves of the *Convolvulus laurifolia*, both vegetable productions rich in azotised matters. These placed in his closed crucible will give an azotised carbon in contact with the metal. And what may have been the origin of this far back practice of the East—this, to us, apparently empirical handicraft of some Indian artificer? Has it originally been the result of some mere accident or of some induction or deduction; or is it a relic of some state of civilization and of science superior to those of the West? The Sheffield artizan seeks, even up to the present day, that which the Indian artificer had found out ages ago.

It will be distinctly understood that the facts and reactions given by the writer have not yet been extended in manufacturing operations, but they are more than merely experimental.

The value of combinations of carbon and nitrogen in steel making being acknowledged, then, of all such combinations or of elements containing these, it is undoubtedly to the use of the cyanogen compounds that we should resort for all manufacturing purposes; and the time seems not very far distant when these compounds will become some of the most readily obtained and cheapest of chemically-manufactured products. It is some years ago now that Mr. Lewis Thompson pointed out how these could be had through the nitrogen of the atmosphere, and thus gave the germ of a branch of manufacture that will grow into vast importance; and for the promulgation of which the world is indebted to this society.*

The operations of the blast furnace suggest methods for the production of those compounds that are of the highest practical value. There are at play here all the elements for the prodution of cyanogen, of certain cyanides, and thence of other compounds, and the requisite conditions can be superadded for securing these for commercial purposes. That cyanogen was formed in certain zones of the furnace was proved by Bunsen and Playfair. Dr. Clark, of Aberdeen, many years ago, examined a saline product that was found to ooze out of the tuyere holes of a blast furnace in Scotland, and discovered it to be cyanide of potassium. In several places on the Continent, as at Mariazoll, in Styria, for example, we are told by Gmelin, that this product is so abundant as to be sold commercially for galvanic gilding purposes. It is, of course, the product of cyanogen, when combined with the accumulated proportion of potash contained in the fluxing limestone. But why not specially add the alkaline element, and combine in the furnace simultaneously the peculiar reducing and converting actions of these compounds with their special manufacture for other and equally valuable industrial applications of them that are springing up? And this is undoubtedly one of the most important of the directions that the iron manufacture of this country will in future be found to take.

In the course of a discussion that followed the reading of Mr. Binks's paper, Mr. F. A. Abel, the chemical officer of the Board of Ordnance, said, the arguments and facts upon which Mr. Binks based the assumption that nitrogen was an essential element in steel, and that indeed steel could only be produced by the union of iron with nitrogen in addition to carbon, were entitled to the most deliberate consideration and to the closest investigation. It would be presumptuous, without such investigation, to enter upon their discussion, or to challenge the construction placed by Mr. Binks upon various circumstances alluded to by him. Assuming, however, that steel cannot be obtained without the entrance of a certain quantity of nitrogen into the constitution of the metal, he (Mr. Abel) was curious to learn in what manner Mr. Binks accounted for the production of steel by the decarbonization of finely divided cast, or partially refined iron in closed crucibles, by such means as those proposed by Captain Uchatius, or by fusing together, in a closed crucible, the proper proportions of cast and wrought-iron, the former containing only a trace of nitrogen, and the latter none of that element. With reference to the proportion of nitrogen which Mr. Binks had found by analysis to exist in steel, Mr. Abel would venture to observe that it appeared to exceed considerably the quantity which a perusal of M. Marchand's publication "On the Determination of

* Mr. Thompson's paper appears in the "Transactions of the Society of Arts" for the year 1837.

Nitrogen in Iron" would lead the reader to suppose as actually existing in cast-iron and steel. It would have been desirable that some description of the precautions adopted by Mr. Binks to exclude errors had been entered into in a paper of such interest and importance, in order to ensure for the results given by him the confidence to which doubtless they were entitled. It must be admitted that some great influence appeared to be exerted by the presence of nitrogen in some form or other in the production of steel; and our knowledge of the reactions in the blast furnace would alone lead us to believe that, indirectly, nitrogen was, with reference to the reduction of iron, a very important agent; but if the suggestion thrown out by Mr. Binks, that steel be an alloy of iron with carbon and nitrogen be adopted, the latter element must be viewed in a new light; for it must have become endowed with very active properties if so small a quantity as even Mr. Binks showed to exist in steel could exert so important an influence upon the character of iron, an influence far surpassing that exerted upon iron by similar proportions of elements remarkable for their chemical activity, which were constantly found associated with that metal. A complete elaboration of the views brought forward by Mr. Binks would not therefore fail to be replete with interest, and amply to repay the labours of the scientific, and doubless also of the practical investigator.

THE NAUTILUS SUBMARINE MACHINE.

Several experiments with this machine, which was described and illustrated at page 242, of No. 1753, of this Magazine, for March 14, 1857, were made on Tuesday, the 9th, at the Victoria Docks, in the presence and under the inspection of numerous engineers and other scientific men, including Mr. Robert Stephenson, M.P., F.R.S., Mr. G. Parker Bidder, Sir S. Morton Peto, Bart., Mr. Joseph Locke, M.P., F.R.S., Mr. Edwin Clark, Mr. Charles Manby, F.R.S., Mr. Charles Vignoles, F.R.S., Mr. J. Scott Russell, F.R.S., Mr. J. P. Gassiott, F.R.S., Mr. W. Bridges Adams, and Mr. Appold. Many of the gentlemen present descended in the machine, and examined the details of its construction, as well as the arrangements for the supply of air. It was clearly demonstrated, not only that several persons could remain in it under water for a considerable time, but that even if the tube communicating with the reservoir at the surface should accidentally become disconnected, no danger would ensue to those in the machine, as they were able, by means of the compressed air within the bell itself, to expel a portion of the water and thus to rise to the surface. The Nautilus has been for some time in use at the Victoria Docks, in relaying the sills of the dock-gate. At the close of the experiments a *déjeuner* was provided for the company present, Mr. G. P. Bidder occupying the chair.

Mr. Robert Stephenson, in proposing "Success to the Nautilus Company," said this was a machine of which almost every civil engineer had felt the want; and whilst the use of the old diving bell was confined to certain conditions not always to be obtained, this was universally applicable and ready for use in the most difficult cases. The engine and condensing pump, which he had inspected, were scarcely inferior in ingenuity and completeness to the diving apparatus itself. He expressed his conviction, from a personal examination of the capabilities of the machine, that he had never witnessed one so perfectly adapted to the purposes for which it had been designed. He had it from the resident engineer of the docks that the same amount of work that had, previously to the introduction of the Nautilus, been performed in three weeks and four days, had been got through by its means in two days and two hours, with the same number of men employed.

The following is the report of the resident engineer:

"Victoria Docks, June 8th, 1857.

"The work performed by the Nautilus, under my superintendence, in replacing the roller-path of the outer gates at this dock, has been, for the week ending the 6th inst., forty-three hours, or four days and three hours. In this time, two sections have been cut around (concrete), the connecting bolts cut off, the old paths taken up, and two new ones replaced. One entire tide was lost, of eight hours, in replacing some wedges which were disturbed by the opening of the dock gates. The last section was placed in twenty minutes after being lowered down. During the time the dock has been undergoing this operation, the gates have been regularly opened every tide, no delay whatever having been experienced. I have yet five other sections to put down. Last summer, in putting down a new, and removing one old section, by the aid of my men in submarine armour, I was occupied three weeks and four days, during all of which time the gates were of necessity open, and the locking was done from the tidal basin. The efficiency of the Nautilus in this operation is demonstrated by its performing the work of three weeks and four days, in two days one and a-half hours, there being no more men employed in the one case than in the other. I have been down in the Nautilus very often, and I am satisfied that very nearly the same amount of work can be done under as above water in laying masonry, &c."

The result is so decided as to the superiority of the Nautilus over all other similar machines, that the use of it will, most probably, become very general for submarine engineering purposes.

THE MANUFACTURE OF SMALL ARMS.

An article in the *Times* of June 2nd on the above subject has elicited from Mr. Goodman, chairman of the Birmingham Military Small Arms Trade, a letter containing certain allegations, which have been replied to by Lieut.-Col. Dixon, Superintendent of the Enfield Small Arms Factory. Mr. Goodman's statements are to the following effect:—That the weapon known as the Enfield rifle is emphatically a Birmingham weapon, modified from the original Minié rifle in the workshop of Mr. Westley Richards; that a return, made up to the 31st of March last, shows that from Birmingham 220,000 rifles have been received by the Government, and from Enfield not one; that the Birmingham manufacturers can scarcely owe anything to examples of superior workmanship received from Enfield when an Enfield-made gun (the production of the new establishment) has never been seen in Birmingham; that the head viewer in Birmingham never visited the establishment at Enfield to see what is being done there, and it is not probable that any one of the sixty-four viewers under him ever did; that the enormous sum already expended at Enfield, and the high wages paid to secure the services of men taken from the workshops in Birmingham, render the attempt to compete with the Birmingham makers in the price of the gun utterly hopeless; that before Enfield can produce a standard to afford an example, Enfield must first attain the step of making as good a gun as the Birmingham makers can make; and that he (Mr. Goodman) has not the slightest hesitation in promising that, whatever the standard may be to which Enfield in future may attain, Birmingham shall attain a still higher.

In replying to these statements Lieut.-Col. Dixon very properly directs attention to the fact upon which we recently insisted in our article upon Mr. Whitworth's efforts, viz., that the question at issue, and that which lies at the basis of the Government manufactory at Enfield, is not merely the making of a rifle, but that the rifle so made should resemble any and every other made in the establishment so completely that all similar parts should be capable of interchanging. If a soldier should lose his bayonet or ramrod (two parts which, from being detached or loose, might very easily be dropped) he may get similar articles to replace them at once without any special fitting being required. All the parts of the arm are made on this principle, and it can easily be conceived how valuable such a principle must be in an army which has to be armed entirely with one pattern of arm. Instead of an armourer having to forge, file, and specially fit any limb to a lock, the finished parts will be supplied to regiments, and will replace in a moment those which have been injured. "This system is one," says Lieut.-Col. Dixon, "which can only be pursued and successfully carried out by a proper condition of manufacture, where all is conducted under the supervision of one head, who watches the progress of every part from the forged to the finished state." And he asks, "Would the Government have done either wisely or well in demanding from the gunmakers of Birmingham that they should accept the Government arm, and manufacture on a similar principle?" and adds, "The arms manufacturers of Birmingham are utterly incapable of carrying out any system of this sort upon their present mode of manufacture; and the Government have consequently exercised only a just forbearance towards them in not insisting upon their acceptance of the Enfield-made arm as a model for them to follow."

"But the real facts of the case," says Col. Dixon, "are that, however for mere political motives it may furnish a good peg to hang a quarrel upon, and so attack the Government, the small arms manufacturers of this country—I speak of those who are enlightened and liberal men, and of such there is no lack—view with interest rather than otherwise the Government establishment, as assisting them to control their men and regulate prices. Almost every gunmaker connected with the military gun trade has been to Enfield to see what he could borrow in the shape of ideas for executing his work better and more cheaply than is at present done; and not only the masters, but also the skilled workmen of the trade, have been sent in large numbers to see the factory, for the purpose of being convinced that another system than that hitherto so blindly followed can produce arms under conditions of quality and interchange of parts unapproachable by the trade. The London Armoury Company has been established to follow in the course pointed out by the Government, and to this company the Government have granted permission to borrow from the factory every means which can assist them in successfully competing with the Government factory. All the parts of arms, in every stage of manufacture, have been forwarded to the company to help them in their endeavours to turn out similar arms to those made at Enfield. Even Birmingham is taking hints from Enfield, and copies of letters received from Mr. Goodman himself are enclosed, in which he applies for assistance and information. Mr. Goodman has, on the part of the Birmingham contractors, thrown out a challenge to the Government

which it is quite possible that they may accept; but I will only caution the authorities, who have still to depend for the supply of every pattern of arm (except the Enfield rifle) upon the arms manufacturers of this country, that not a single arm would be made by the trade—in fact, there would be an immediate suspension of work on the part of the men—if the principle of interchange were insisted upon, or even the same quality of work throughout the entire arm. In proof of this it may be here stated as a fact, that when it was desired lately to introduce the principle of interchange, as far as the sword, bayonets, and ramrods were concerned, in the new pattern short rifles for rifle corps, the Government officers had to yield the point, even before the work had been put into the men's hands, solely on account of a representation made to the Small Arms Department that the difficulties in the way of executing the work on that principle amounted to an impossibility.* Why do not the Birmingham trade follow the example set by the London Armoury Company, and enrol themselves as a company, purchase machinery, and really, by legitimate means, try to beat the Government out of the field? This is open to them, and would be much more to their credit than engaging in a kind of desultory warfare, and making statements which are easily refuted."

With reference to the assertion that the pattern of the Enfield rifle was originally the production of a Birmingham gunmaker, Col. Dixon gives the statement an unqualified denial. "The arm in question," he says, "was proposed by a committee of officers in 1852-3, and was accepted as the result of that committee. Several gunmakers were invited to send models of arms to the committee for trial, but none were found to possess all the different points which were laid down as essential for a military rifle. All the good points of the various arms submitted for trial were carefully considered by the committee, who finally proposed a pattern which has every right to be considered as emanating solely from the committee then sitting at Enfield, and has in consequence been called the 'Enfield rifle.'"

Upon this point we can only allow the conflicting statements to stand for the present.

The whole subject is very important, and we hope that our manufacturers will, in discussing it, exhibit that fairness to the Government which the ostensible, and probably the real aim of its efforts most certainly demands.

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* Mr. Goodman has subsequently replied to this by stating, that the bayonets, &c., in question were of German manufacture, and defective in form.

SIR FRANCIS KNOWLES' PATENT IMPROVEMENTS IN THE MANUFACTURE OF IRON AND STEEL.

Sir Francis Charles Knowles, Bart., of Lovell-hill, Berks, has patented an invention, which consists of three parts. 1. An improved method of preparing fuel from wood, spent tan, peat, or coal, to be used, or admitting of being used, in the manufacture of iron. For this purpose kilns, ovens, or retorts are constructed of considerable size, capable of containing a large quantity of the raw material to be employed, and admitting of being closed up after being charged. These may be conveniently constructed of fire-brick of any form or material; but must be such as to admit of a pipe, or flues, for the introduction of the heated gases to be presently described, and of other pipes or flues for the exit of the various liquid products of the consequent dry distillation, and of the gases which will thereby be evolved, and to provide for the proper collection of the same by passing them through such hydraulic and other pipes as are used in gas works, or some convenient modification thereof, and for their subsequent cooling, condensation, purification (if required), and collection in appropriate vessels, receptacles, and gasometers respectively. To the pipes, both of entrance and of exit, are adapted cocks or taps whereby the current of the gases and other products may be cut off or diverted at pleasure while the charcoal or the coke is cooling, or being discharged, or otherwise, and a series of kilns, ovens, or retorts, are employed as usual, so that some may be in work while others are out. The kilns, ovens, or retorts, being thus constructed and charged with the raw material, and the entrance pipes or flues and the exit also being open, the patentee introduces through the former the heated gases collected from the top of the blast furnace by any of the modes in use, which gases issue at a heat of about 1,800 deg. Fahr., and the current of these gases is allowed to pass through the kilns, ovens, or retorts moderately at first, until the fuel is dried, afterwards in full force, and thence into and through the hydraulic pipes to the reservoirs, purifiers, condensers, and gasometers. The furnace gases being incapable of supporting any combustion, act merely by their heat in producing the requisite dry distillation, and pass away afterwards mixed with the gases cooled during the operation; but, after being cooled, purified (if need be) and collected in gasometers, they form a fuel of great power, applicable in all the subsequent stages of manufacture, and dispensing entirely with the further use of coal. The second part of the invention consists of a

kiln or a furnace for the conversion of cast iron into malleable iron or steel. This is constructed of firebrick or other refractory materials, and it may be cylindrical, square, prismatic, or of a truncated, conical, or pyramidal form. It is furnished with a tap hole like other furnaces, but the essence of this part of the invention is the adaptation of pipes in the interior of the furnace or kiln, which commencing at the top thereof, descend nearly to the bottom, where they are open so as to admit of the metal rising within them when the furnace is filled with it in its hot and liquid state. These pipes are to be made of good fireclay, or some very refractory material, and to their tops are to be fitted closely the blast-pipes of the blowing engine. When it is desired to refine or convert the metal, the metal is first let into the kiln or furnace as hot as possible, and this rising to the same level in the pipes and in the furnace, the blast of adequate pressure is turned on, and the same is forced through the surface of the metal downwards, which is refined thereby in the usual way to any required degree, whether for steel or for iron, according to the time of the operation. The third part of the invention consists in the blowing or forcing of pure hydrogen gas, or of carburetted hydrogen gas, either pure or mixed as before described with the blast furnace gases and purified into the melted metal in any direction whatever, so that the metal and the gas may be thoroughly agitated together. The effect is to purify the metal from sulphur and phosphorus; and further, in the case of the carburetted gases to give carbon to the metal, in case, in the making of steel, the previous operation of decarbonization should have been carried too far for the particular quality of steel sought to be produced.

Mechanical Science and the Prize System in Relation to Agriculture. By William Day. London: Harrison, 59, Pall Mall. 1857.

The writer of this pamphlet opposes the existing system of offering prizes for improvements in agricultural implements, &c., and recommends the following arrangement instead of it.

"All the implements sent for exhibition to any of the periodical shows of the Royal Agricultural Society might, as now, be divided into sections. An annual trial of each section should be given, and ample time devoted to it. The mode of trial to be in accordance, as nearly as circumstances would admit, with agricultural practice. Previous to the trials, a competent board of examiners, composed of agriculturists and agricultural implement makers, with the consulting engineers of the society, should agree upon the points of excellence to be noted. With these points arranged beforehand, the tasks of the jurors would be rendered definite and systematic, and therefore less difficult than by the present mode; while, at the same time, their reports would prove more advantageous to both the sellers and buyers of such implements if published immediately after the awards. Such reports should include the opinion, fully set forth, of the agricultural jurors on the merits and defects of the implements, in a practical and economical point of view, and the opinion of the engineers on the mechanical advantages and disadvantages of everything that related to the design and workmanship. To be effective, great care should be taken to frame these reports in a judicial, not in a competitive spirit, so that they might not only be a safe guide as to what to purchase, but what to reject, and so effectually discourage the production of mere prize toys."

To give due effect to this plan, and general assent to the principles of it, no money-prize is to be offered. "The trade value of a real improvement far outweighs," says Mr. Day, "any amount likely to be given in immediate cash, or indeed any honour that can be conferred by mere prizes. The farmers will be sure to reward amply, by their purchases, the meritorious producer of any approved implement. All kinds of merit, as well as all grades of exhibitors, whether rich or poor, high or low, would thus stand on equal ground, and be judged alone by their deserts, agreeably to the dictates of that impartiality and honesty which should be scrupulously observed in all cases of this nature. One great recommendation of this plan is, that it would protect competitors from the abuses incidental to the existing system of rewards, which exalts the few gainers of prizes, to the detriment and discouragement of a host of others."

Any person feeling an interest in this subject would do well to read the pamphlet, which contains much good sense, notwithstanding its frequent citations from the poets.

THE NEW INDUCTION COILS.

128, Sloane-street, Chelsea,
June 15, 1857.

To the Editor of the Mechanics' Magazine.

Sir,—Will you permit me to ask Mr. Hearder where I can see an account of the manner in which he has constructed his induction coils? Up to the present time I have been unable to ascertain the precise method adopted by him in insulating the layers of wire on his instruments. He stated in the *Philosophical Magazine* that he used sheet gutta percha for that purpose;

but after his lectures in London he informed us that oiled silk had been adopted by him for the insulation of his coils, and in neither case has he informed the public in what manner he has applied these insulating materials.

It is therefore very unfair of him to make the following remark: "In conclusion, I may remark, that some of the contrivances of my machine are very peculiar; and it is a remarkable fact, that every contrivance adopted by Mr. Bentley was embodied in my original machine." Now, that my induction coil may be similar in some of its arrangements to Mr. Hearder's is possible; but that it is identical in all its most important parts, I have yet to learn.

Mr. Hearder expresses surprise that I should make such an "amazing improvement" in March, and wait until September to ask Dr. Noad to try it against Ruhmkorff's machines. A few lines below this, he says that this machine was completed about the middle of 1855, and the details of its construction communicated to Mr. Grove in November; consequently, he waited for as long a period as I did.

I assure Mr. Hearder it was not the "amazing improvement," which was made in March, but the coil itself. Mr. Hearder must know by experience that I must have studied the action of this machine for years before I could effect any great improvement in it, and I have now in my possession a small induction coil 4½ inches long, which was constructed in 1855; it gives a spark one-third of an inch long in air, and it is peculiar in having two secondary coils; one enveloped by the primary wire, the other exterior to it; and it was mainly owing to the action of one of these secondary coils upon the other that led to the production of my present instrument.

In conclusion, I beg to state, that I do not wish to take any of the credit justly due to Mr. Hearder, but to make myself as useful as possible to tyro electricians, like myself; and it was for this purpose that I made the details of the construction of my coil public, so as to enable any individual, possessing an ordinary degree of astuteness, to construct one for himself.

I am, Sir, yours, &c.,
C. A. Bentley.

SURFACE CONDENSATION.

To the Editor of the Mechanics' Magazine.

Sir,—In a recent *Mechanics' Magazine*, the article on surface condensation has raised again an interest in the matter.

It has been long known from experiment and experience that condensation of steam is most rapid when the steam is acted upon by a running stream of cold water, flowing side by side with it, and separated by any metallic conductor of heat. Of course, the better the conductor, the more rapid the condensation. It is also known that condensation is accelerated by the presence of hot water; that is, when steam has fallen back into hot water, the presence of this helps forward continuous condensation. For example, take a pipe of about 30 feet in length, immerse it in a stream of cold water, pass through it steam at say 35 lbs. pressure; the steam will issue as steam. Take the same pipe, and bend it near the end, so that a short portion of it shall be below the general level of the pipe, and pass the steam again through it; at first, it will issue as steam, but, as soon as the bend has accumulated hot water, the steam will issue from the end of the pipe in a continuous flow of hot water.

Acting upon this knowledge, a patent was taken out for the improvement of steam navigation. It contemplates much greater simplicity of construction, greater power, and the use of fresh hot, instead of cold salt water. These, as advantages, need not be insisted upon or proved. It is easily seen that, if condensation can be effected by means independent of the machinery, the present complex construction may be greatly simplified. It can also be seen that, if the labour now thrown upon the machinery be transferred to external and independent aids, all this labour saved is so much power gained.

The patent contemplates not only condensation, but the formation also of what may be called a natural vacuum. To philosophic ears this expression will sound fanciful and untrue. Nevertheless, the term vacuum as here employed is true to the full extent, as employed by machinists. It means the removing from the issuing used steam the counteracting pressure of the atmosphere. At present, in what are called low-pressure engines, this is effected by the machinery; in high-pressure marine steam engines, the steam escapes into the air, and is diminished in force by the counteracting pressure of the atmosphere. The patent proposes to effect a vacuum, let the steam be high or low, that is, if above or below the atmospheric pressure, by means unaided by the machinery, and in a way the most simple, natural, and efficacious.

It is effected thus: Let a pipe, bent in the manner before stated, issue or enter into a closed vessel. Upon the upper part of this vessel let a valve be placed opening outward. In the under part of the bend in the pipe before described let a cock be inserted. It will be seen that when the engine is at rest, and this cock open, the

pipe and vessel are filled with air, excepting where water may lie at the bottom of the closed vessel from previous deposition. Now let the steam be turned on, and the engine set to work. At first, the steam will flow in full force through the pipe, and into the closed vessel. It will have power enough at first to lift the valve at the top of the vessel, if the cock be turned at the bend as soon as steam issues thence. The steam, having expelled the air in the pipe through the cock, as soon as the cock is stopped exerts itself upon the valve, lifts it, and expels the air in the vessel. Water accumulates in the bend, condensation goes on, the valve closes, and the atmospheric pressure is removed.

The patent provides for a cistern above the closed vessel, so as to keep at all times at a given level the water in the closed vessel to be pumped again and again into the boilers, thus keeping up a continual supply of hot fresh water to the boilers. The cistern is to be supplied with fresh water when opportunities offer. Should the waste be greater than provided for, and it should become necessary to supply salt water, yet, this being worked within a circle, the amount of saline deposit would be almost inappreciable.

The patent only applies to steam navigation, because here the element of success is always present, namely, a running or passing stream of cold water.

I am, Sir, yours, &c.,

J. B.

STEAM SHIP ARITHMETIC.

To the Editor of the Mechanics' Magazine.

Sir,—The two subjects proposed by the Institution of Civil Engineers, on which my paper on high speed steam navigation was founded, namely, "An examination of the circumstances which appear to limit the maintenance of higher speeds in deep sea navigation," &c., &c., and "On the relative efficiency of the screw propeller and paddle wheel," &c., &c., is a proof that the formula

$$\frac{V^3 D^{\frac{2}{3}}}{I H P} = C,$$

is not sufficient to point out how those limits may be surmounted, and whether the screw or paddle is the most efficient propeller; two most important questions in the progress of ocean steam navigation; if it had been sufficient a paper on the subject would not have been necessary.

The proposition of those subjects implies what are the necessary requirements in the construction of a steam ship for any velocity; while the formula

$$\frac{V^3 D^{\frac{2}{3}}}{I H P} = C,$$

merely professes after the trial to give an index number, which represents the *type* of vessel, the quantities of which have never been defined. To me, it is surprising how such a formula could have been tolerated, when its shallowness was so transparent. What are the component parts of an index number? it is the sum which if multiplied by the I H P is equal the product of V^3 and $D^{\frac{2}{3}}$; now it must be evident to any one of ordinary arithmetical logic, that two of the terms may be so varied that the same index number may be made to represent the most opposite and impossible extremes as an illustration, namely,

$$\frac{V^3 \times D^{\frac{2}{3}}}{I H P \times C} = \frac{1000 \times 1}{50 \times 20} = \frac{1 \times 1000}{50 \times 20} = \frac{125 \times 8}{50 \times 20}$$
$$= \frac{8 \times 125}{50 \times 20}$$

ad infinitum. To be brief, these assumed examples are the same type according to that formula; the first, representing one ton of displacement, propelled 10 knots per hour by 50 I H P; the second, 31,620 tons, 1 knot per hour; the third, 23 tons, 5 knots per hour; and in the fourth, 1,250 tons, 2 knots per hour, with the same amount of I H P. Yet an attempt has been made to "*squeeze out of this simple formula*" the whole science of naval architecture and steam transport economy. With respect to the question of velocity, the section to the line of motion has always been adopted as the measure of the resistance, and not any portion of the weight of the vessel, resistance must be measured by surface, not the cubical contents in tons; what possible part of a ship is the cube root of the square of the displacement in weight (tons)? If $D^{\frac{2}{3}}$ is an approximation to the midship section, why not take that section for questions of velocity? but the object of the formula or its application appears to me to embrace "*more than experience will fairly warrant.*"

The dynamic performances of a vessel cannot be more simply expressed than by the number of tons carried by one H P a conceded distance; an index number produced by that formula is no criterion of the economy of the vessel; for instance, the *Dwarf*, 276; *Archer*, 275; and *Minx*, 263; the proportion of displacement to one nominal H P being respectively 1·1, 6, and 2 tons, and the velocities 10·5, 7·8, and 9·1 knots. Again, where the vessels have an equal velocity, the *Dauntless* and *Dwarf*, in the former 4 tons, and in the latter 1·1 tons is carried by one N H P, the index numbers being 322 and 276, a difference of 16 per cent. in favour of the former, while common sense would say the *Dauntless* was 350 per cent more profitable. Lastly, the *Ajax* and *Phœnix*, the velocity of both 7·1 knots, index numbers 91, and 158, and the amount of displacement to each N H P, 7, and 4·5 tons. To me the index numbers of these two vessels ought to be reversed, but they are sufficient to show that my assumed illustrations are equalled in absurdity in their application to vessels.

If $D^{\frac{2}{3}}$ is the true element in calculations of velocity, the question becomes, the amount of H P required for each unit of $D^{\frac{2}{3}}$ for every rate of velocity, on the same principle as my standard, that 64, 100—144 and 196 effective HP, are the proportions of power to each 100 square feet of midship section, for 8, 10, 12, and 14 miles per hour; in opposition to this proposed ratio of power to midship section, the question ought to be—Are these amounts of power too great or too small, and has the midship section nothing to do with the question of velocity, or is it entirely due to $D^{\frac{2}{3}}$?

It must be obvious with respect to V^2 or V^3 that the margin is so great, that the elucidation of the truth of V^2 or V^3 ought to be comparatively easy, if a means could be adopted for that purpose. Therefore, for the sake of argument, I will adopt the *true* formula as the means, and the index numbers as the proof of the incorrectness of the propelling power increasing as the cube of the velocity. It must be evident to any one conversant with steam navigation, that no instrument of propulsion is so efficient at high as at low velocities, that there must be a waste of

power above the true ratio, and that in the application of any formula, whether empirical or not, the vessels with the highest velocities ought to exhibit the lowest measure of efficiency, or index number; on the contrary the vessels with the highest velocities exhibit the greatest index number by both the cube formulæ, and just in proportion to the difference between the square and cube ratio.

In order to show that the theory of the cube is inadmissible, I will take three examples in which the necessary conditions for a comparison are sufficiently equal; namely, the *Fairy*, *Teaser* diminished, and *Minx* diminished.

First. The *Teaser* compared with the *Fairy*.

$$\begin{array}{ccccccc} \text{V.} & & \text{I. H. P.} & & \text{V.} & & \text{I. H. P.} \\ 7{\cdot}7^2 & : & 128 & :: & 13{\cdot}3^2 & : & 384 \\ 7{\cdot}7^3 & : & 128 & :: & 13{\cdot}3^3 & : & 660 \end{array}\Bigg\}\text{ actual 364.}$$

Second. The *Minx* compared with the *Fairy*.

$$\left.\begin{array}{ccccccc} 4{\cdot}51^2 & : & 32 & :: & 13{\cdot}3^2 & : & 279 \\ 4{\cdot}51^3 & : & 32 & :: & 13{\cdot}3^3 & : & 820 \end{array}\right\}\text{actual 364.}$$

or, where theory and practice agree in the *Minx*, to show that this method of comparison is correct:

$$\left.\begin{array}{ccccccc} 4{\cdot}51^2 & : & 32 & :: & 9{\cdot}14^2 & : & 129 \\ 4{\cdot}51^3 & : & 32 & :: & 9{\cdot}14^3 & : & 262 \end{array}\right\}\text{actual 234.}$$

Third. The two trials of the *Dauntless*.

$$\left.\begin{array}{ccccccc} 7{\cdot}36^2 & : & 810 & :: & 10{\cdot}3^2 & : & 1590 \\ 7{\cdot}36^3 & : & 810 & :: & 10\ 3^3 & . & 2224 \end{array}\right\}\text{actual 1218.}$$

Fourth. In the two trials of the *Desperate*.

$$\begin{array}{ccccccc} \text{V.} & & \text{I. H. P.} & & \text{V.} & & \text{I. H. P.} \\ 8{\cdot}87 & : & 689 & :: & 10{\cdot}7^2 & : & 1000 \\ 8{\cdot}87 & : & 689 & :: & 10{\cdot}7^3 & \cdot & 1211 \end{array}\Bigg\}\text{actual 892.}$$

Fifth. The two trials of the *Termagant*.

$$\left.\begin{array}{ccccccc} 6{\cdot}51^2 & : & 734 & :: & 9{\cdot}16^2 & : & 1450 \\ 6{\cdot}51^3 & : & 734 & :: & 9{\cdot}16^3 & : & 2050 \end{array}\right\}\text{actual 1245.}$$

Lastly. Two trials of the *Charlemagne*.

$$\left.\begin{array}{ccccccc} 8^2 & : & 257 & :: & 10{\cdot}9^2 & : & 447 \\ 8^3 & : & 257 & :: & 10{\cdot}9^3 & : & 650 \end{array}\right\}\text{actual 522.}$$

In every example the deduced I H P, by the square comparison, is under the actual; it is with this system of reasoning that I have arrived at the conclusion, that the propelling power varies as the squares of the velocity, for I can fearlessly assert (the *Minx* excepted) that no comparison between any two vessels in the well-known list of screw steamers in H. M. service, or the trial trips of the Peninsular and Oriental Company, can furnish the slightest proof in favour of the cube theory. If I am wrong, let the recognized authorities point out in what manner my system of reasoning is wrong. All that I ask for is the manner in which the cube theory is proved practically correct, resulting from any comparison in those well-authenticated lists of steamers. The cube theory, to be consistent, must prove that if power is the "*force and space passed over*," the space passed through by the piston must be multiplied into the space passed over by the vessel in calculating the power of the engine. It must prove that if the resistance is increased four times by increased midship section, in that proportion, eight times the power is required for the same space, the same as if the resistance was increased four times by a doubled velocity; and that if two engines of equal magnitude were put into the *Banshee* and the *Duke of Wellington*, the H P, coal, and steam expended, would be in the proportion as the *spaces* passed over, and not as the *time*.

In conclusion, I venture to suggest to those writers on the "Conservation of Force," the solution of the problem that the propelling power increases as the cube, while the resistance only increases as the square of the velocity; and of that anomaly, namely, for a doubled velocity, twice the quantity of water has to be removed, to prove to a demonstration how that water can be struck with a fourfold force. I am, Sir, yours, &c.,

ROBERT ARMSTRONG.

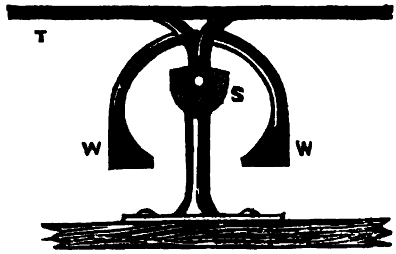
11, Mercer's-terrace, Salmon's-lane, Limehouse, E.

[According to our promise, we insert Mr. Armstrong's letter, which we must leave to the judgment of our readers. For our part, we do not intend to re-open the question, seeing nothing in what Mr. Armstrong has advanced to induce us to do so.—ED. M. M.]

TABLES FOR SEA USE.

To the Editor of the Mechanics' Magazine.

SIR,—I beg to propose the following mode of constructing tables, in order that they may keep their horizontal position when a vessel is in motion. The table, T,



moves by means of a ball fixed in the socket, S, which is fastened to the deck. W W are weights which preserve it in a horizontal position. The same principle would, of course, apply to many forms; but it is the idea which I here wish to convey.

I am, Sir, yours, &c.,

J. A. D.

THE ARCHIMEDEAN BALLOON.

To the Editor of the Mechanics' Magazine.

SIR,—In reply to the last letter of "An Amateur," I admit that my fourth letter on "The Practicability of Aërial Navigation" did not indicate the existence of the other three, and so far there is some excuse for his oversight. But I regret to find that, although he has now read the entire series, he is still the subject of serious misconceptions as to the nature of my invention. "An Amateur" says that I propose to cover my elongated balloon with a framework. I can assure him that I never had the remotest idea of doing anything of the kind, either in wood or iron, which he "presumes" to be the material for that purpose. "An Amateur" also tells me that my paddle-wheels have a "shifting cover," which certainly is the first I have heard of it, as my paddle-wheels have no cover whatever, shifting or otherwise. "An

Amateur" further observes—"It is clear that the *Great Eastern*, now building, is the model upon which your correspondent has constructed *in his mind* his wonderful Archimedean paddle-wheel balloon." I must confess this is not equally clear to myself, seeing that my plans were published, with numerous woodcuts, in the *Mechanics' Magazine* for June 5, 1847, and June 10, 1848, some years before the *Great Eastern* was thought of. This chronological information was given in the first of my four letters, which "An Amateur" professes to have read; and it would be well if your correspondent would be good enough to read the plans which I published at the foregoing dates, that he may really know what is the nature of my "wonderful Archimedean" invention. At present he has scarcely made one correct reference to my machine, and his remarks have about as much to do with the Archimedean balloon as they have with the great sea serpent, or with Lord Carlingford's aërial chariot. I can assure "An Amateur" that I am prepared to endure any amount of criticism, but I am not so well prepared to endure misrepresentation. I am, Sir, yours, &c.,

J. Pitter.

254, High-street, Borough, S.E.,
June 13, 1857.

MISCELLANEOUS INTELLIGENCE.

Science in France.—We learn from Messrs. Armengaud's valuable publication, *Le Génie Industriel*, that a society for aiding scientific persons of humble means, has just been founded in Paris, entitled "*Société de Secours des Amis des Sciences*," under the auspices of M. Le Baron Thénard. This Society held its first sitting on the 5th of March last, when articles and statutes for its regulation were voted. The annual subscription is to be but 10 francs, and aid is to be offered to all persons (belonging to France) who need and merit it, whether members or not; and also to their families, in the event of their decease. The chief test of merit is the production of a memoir or work approved of by the Academy of Sciences.

The Planet Saturn.—Every improvement of the telescope brings to light some new feature in the appearance of Saturn. During the last three or four years, when the planet has been very favourably situated, with the ring fully opened, the attention of astronomers, possessing powerful telescopes, has been directed to an appearance on the outer bright ring, which was asserted to be another division—thus forming three separate bright rings. Others, though possessing large instruments, not only questioned the division of the outer ring, but doubted the existence of any mark whatever. During this time several very fine lithographic prints of Saturn have been published by the respective observers—some with and others without the controverted division. Among those showing a black division were two very excellent ones—by Captain Jacob, of the East India Company's Madras Observatory, and Mr. De la Rue, of London. In the early part of last year, while the matter stood thus, a paper by Mr. John Watson, of Washington Chemical Works, was read before the Royal Astronomical Society, in which the author reported having several times, with his large telescope, not only seen the mark in question, but that he was able to speak positively as to its real nature, viz., that it is not a division, but a mere belt or streak, similar in appearance to the belts which so conspicuously cover the balls of Jupiter and Saturn. Yet, Mr. Watson's evidence was to be weighed against a bulky mass on the other side, and was hardly considered conclusive. Captain Jacob now writes from Madras, that, with the large telescope of that observatory, and in a fine atmosphere, "He can fully confirm the opinion expressed by Mr. Watson as to the nature of the mark on the outer ring, viz., that it is not a division, but a mark or streak. It is not at all difficult to see here; indeed, I cannot (he continued) look at Saturn, when the atmosphere is at all fit for observing, without seeing it. But further, it is my opinion that the principal division, so called, is of the same nature, viz., a belt or mark, and not a clear space or division; for I not only see it of a brown hue, but can distinctly make out the shadow of the planet across it." This is startling information for astronomers.—*Northern Daily Express.*

Allan's Electro-magnetic Engine.—We translate the following remarks respecting Mr. Allan's invention from the *Opinione* of Turin: "Another inventor of a new motive power by means of electricity has just appeared. This time there is no mistake, and Europe is indebted to Napoleon III. for having tested and made public a most important discovery, which will not altogether supersede steam, but will, under certain circumstances, replace it, or be economically employed in places where steam power cannot be used. A civil engineer, named Thomas Allan, a native of Edinburgh, had for years turned his attention to electricity, with a view to its application to machinery. His perseverance was rewarded, and the results of experiments made by him on a small scale satisfied him that he had solved the problem, that the principle on which he had constructed his

machine was correct. Still the very importance of the discovery, coupled with numerous previous failures, made many persons sceptical. Fortunately, Mr. Allan applied to Mr. Forbes Campbell, who had become acquainted with Prince Louis Napoleon when he lived retired in England, and who had then been on many occasions useful to him. Mr. Forbes Campbell proceeded lately to Paris, and apprised his Majesty of the invention of his fellow-countryman. Within forty-eight hours an Imperial Commission was appointed to examine and report on the invention. His Majesty placed at the head of the commission General Morin, a member of the Institute and Director of the '*Conservatoire des Arts et Métiers*,' when the series of experiments were made. The results of these experiments surpassed expectation. The Commission recommended the French Government warmly and unanimously to make at its own expense trials on a large scale. On Monday, the 20th April, his Majesty devoted upwards of an hour to the minute examination of the engine in all its details, and discussed with the inventor electricity in all its bearings and applications. In his youth, Napoleon III. studied mathematics and mechanics deeply, and few professors possess so thorough a knowledge of them as he does. No one, therefore, is more competent to form an opinion for himself as to the value and importance of Mr. Allan's invention. The Emperor was delighted with the experiments, confirmed the report of the Commission, and congratulated Mr. Allan on having successfully solved the greatest problem of our time. It is said to be the Emperor's intention to purchase this invention, in order that the discovery may at once become public property in France, and be generally adopted. How fortunate the nation that has such a ruler! how fortunate the man of science who meets with such a patron!!"

A Domestic Novelty.—A good deal has been heard about the American Washing Machine. The latest novelty of the kind is, however, an Englishman's invention. The latter machine not only washes in a superior manner, and with the smallest amount of labour, but also wrings the clothes and mangles them in the most highly finished style. Its construction is so extremely simple that it cannot possibly tear or injure the most delicate fabrics, and may be worked by a child. The manufacturers, Messrs. William Dray, and Co., of Swan-lane, Upper Thames-street, London, forward illustrated and descriptive catalogues free on application.—*Aris's Birmingham Gazette.*

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Allen, T. *An improvement in the manufacture of iron and other metallic bedsteads.* Dated Oct. 14, 1856. (No. 2405.)

This consists in forming metal corner pieces suitable for receiving tubular side foot and head rails, and also tubular uprights or posts.

Guillaume, G. *An apparatus for obtaining motive power, by means of water or other fluid.* Dated Oct. 15, 1856. (No. 2406.)

This relates to a hydraulic lever, adapted to bring into use the power of the rise and fall of the tide, the water from reservoirs, running streams, &c. The action of it is this:—A central vessel oscillates on its axis, its arms alternately rising and falling, which action is induced by the admission of water to the one arm when at the highest point of its motion. The escape valve is opened simultaneously therewith in the opposite and lower arm. The lower arm being emptied of its contents, and the higher one filled, the latter preponderates, and causes the machine to oscillate, when a change in the valves again takes place, and induces the opposite oscillation, and so on.

Hallen, E. *Improvements in the construction of chairs, sofas, bedsteads, and similar articles of furniture to sit or recline upon.* Dated Oct. 15, 1856. (No. 2408.)

This consists—1. In making certain iron chairs and stools which fold up into a small compass. 2. In making bedsteads to fold up so as to make a chair or sofa with a back, and with or without elbows. 3. In making the backs of chairs to recline at different angles with the seat, and in constructing the elbows of chairs so that they shall assist in keeping the backs at different inclinations. 4. In making bedsteads to back up in a small compass. 5. In applying willow work or cording of suitable materials or various colours to iron frames of furniture.

Burrows, J. *An improved arrangement of apparatus employed in winding coals or other minerals from mines, which said improvement is also applicable for other similar purposes.* Dated Oct. 15, 1856. (No. 2409.)

This relates to a method of counterbalancing the weight of the rope, band, chain, &c., employed when winding minerals from mines, by the use of an extra rope or chain, or other counterpoise attached to each cage.

Heywood, B. J. *Improvements in valves for inflating air-tight bags, cushions, and other similar articles, and for drawing off liquids.* Dated Oct. 15, 1856. (No. 2410.)

Into the mouth of the bag a threaded

socket is fitted. In the bottom of this socket is a hole, and round the hole a conical enlargement which fits into a similar depression in the plug which screws into the socket, and round this depression in the plug a series of inclined holes are bored, so as to lead into a single hole in the top of the plug. To inflate the bag the plug is turned round, so as to raise it from the cone at the bottom of the socket, and air is (by the mouth or otherwise) forced into the hole at the top of the plug; to close the communication the plug is screwed down on to the cone in the socket.

Turner, A. and L. *An improved manufacture of elastic fabrics.* Dated Oct. 15, 1856. (No. 2411.)

This consists in combining strands of india-rubber and woven fabrics together by stitching or sewing with threads or yarns.

Hazeldine, G. *Improvements in carriages requiring "poles" between the horses or draught animals.* Dated Oct. 15, 1856. (No. 2413.)

This consists in providing carriages with a pole, made in two parts, the hind part being secured to the carriages, and the fore part jointed to the hind part. Or with a pole, the whole of which is jointed or hinged to the fore carriage, which is suitably constructed.

Collier, G. *Improvements in the manufacture of piled fabrics.* Dated Oct. 16, 1856. (No. 2414.)

These relate—1. To when (as in the specification of a patent, dated 22nd May, 1855,) a cord or band is employed as the means by which the insertion of each pile wire into the open shed is effected, and consists in so arranging the motion given to such band or cord, that the wire may be moved faster in the middle of each motion into the shed than at the beginning or end thereof. 2. To the production of pile fabrics woven double, or face to face, and united by the pile threads in the weaving, to be cut asunder to produce two fabrics; and the improvements apply to vertical looms.

Tooth, A. *An improved process for bleaching malt, whereby the colour is rendered more suitable for the brewing of pale or bright malt liquors.* Dated Oct. 16, 1856. (No. 2415.)

This consists in the employment of sulphur for bleaching malt.

Sturges, R. F. *A new or improved manufacture of rollers or cylinders for printing fabrics.* Dated Oct. 16, 1856. (No. 2417.)

This consists in casting a thick tube of a hard and easily fusible metal or alloy, in the interior of a tube of copper, or alloy of copper.

Wilcox, C. N. *Improvements in the preparation and application of certain vegetable matters, to be used in toilette soaps, pomades, and other like perfumery.* Dated Oct. 17, 1856. (No. 2418.)

These consist in first melting soap as usual in preparing toilette soaps, and then combining the same with a mucilaginous extract of elder flowers, or elder leaves, prepared by pickling, boiling, pressing, and grinding or levigating; and in applying similar processes to combine the mucilaginous extract of elder flowers or elder leaves with other oleaginous matters used in perfumery.

Tombs, E. *Improvements in screw propelling.* Dated Oct. 17, 1856. (No. 4219.)

In the improved propeller the outer ends of the blades are bent at an angle to the plane of the blade.

Foggi, F. *Improvements in the manufacture of engines driven by steam or other vapour.* Dated Oct. 17, 1856. (No. 2421.)

The reciprocating motion of a piston is converted into continuous rectilinear or rotary motion by the adaptation of palls or catches acting against racks or ratches.

Green, J. *An improved cooking apparatus.* Dated Oct. 17, 1856. (No. 2422.)

A light but strong semicircular screen of tin is made with continued flat sides. The bottom of the screen has an opening covered with a lid perforated with holes. Underneath the screen is a small closet, for a vessel to receive the gravy from the opening. A self-acting gravy pan is placed on the top of the screen, which has a regulating screw for controlling the gravy. The top of the screen is inclined, and consequently causes a reflection of heat on the meat. There is also a gibbet of metal, attached to the screen at the back, and extending in a curve over the top, supporting the bottle jack and a chain. There are also shelves inside the screen which can be used for baking, &c., during the roasting. Another part of the invention is a square oven, which can be used separately or in conjunction with the screen. The invention also combines a bottle jack, worked by a spiral or flat spring.

Reed, J. E. *A mixture or compound for the cure of asthma, consumption, and other affections of the chest or lungs.* Dated Oct. 17, 1856. (No. 2424.)

This relates to a mixture compounded of vinegar, garlic, honey, brandy, carraway seeds, and sweet fennel seeds.

Fontainemoreau, P. A. L. de. *Certain improvements in the construction of turbines.* (A communication.) Dated Oct. 17, 1856. (No. 2425.)

This relates to the valves for closing the water way of water wheels, and consists—1. Of a universal valve of gutta percha, or caoutchouc, rolling on a cylinder, and re-

covering its original form when unrolled. 2. Of a double valve of iron or copper. 3. Of a triple valve of the same materials.

FONTAINEMOREAU, P. A. L. DE. *An improved process for purifying brandies and other alcoholic products.* (A communication.) Dated Oct. 17, 1856. (No. 2426.)

This consists in purifying brandy and other alcoholic products by mixing with them several substances, including chloride of lime, hydrate of lime, animal black, &c., &c., and operating upon them in certain ways.

DRAY, W. *An improved method of, and apparatuses to be employed in, the stacking or storing of corn and other agricultural and horticultural produce.* Dated Oct. 17, 1856. (No. 2427.)

This consists in providing channels or passages in stacks, ricks, heaps, and bundles of agricultural and horticultural produce, through which air or purifying agents may be forced to ventilate and dry the same, or destroy insects or vermin therein, as may be necessary.

WILSON, G. *Improvements in power looms.* Dated Oct. 17, 1856. (No. 2428.)

This invention has reference to looms in which two or more shuttles are used, and consists of arrangements whereby two or more picks may be effected from one side of the loom in immediate succession; so that in weaving harness muslins, for example, in which the pattern is produced by the weft, two weft threads of different thicknesses being used, a single shot of either of the threads may be thrown in at any time to suit the pattern.

JEFFREY, W. *Improvements in machinery or apparatus for sawing or cutting wood.* Dated Oct. 17, 1856. (No. 2429.)

This relates to an arrangement of traversing circular saw for cross cutting timber with rapidity and accuracy, as well as to a contrivance of a saw table or bench for insuring accuracy of cut. The driving connections for the traversing circular saw are wholly of the belt pulley kind.

McDOWALL, J. *Improvements in sawing or cutting wood.* Dated Oct. 17, 1856. (No. 2430.)

This relates both to plain straight cut sawing and to differential sawing for curved work, such as ships' timbers. 1. As regards straight cutting, the apparatus employed consists of a contrivance whereby a series of saw frames may be simultaneously worked from one single prime mover, whilst provision is made for the occasional disconnection of any one frame without disturbing the action of the rest. 2. In cutting curved forms, the wood to be acted upon is clamped at each end, between holders carried by a species of slide rest arrangement, each end having its own slide, and both being carried upon a traversing table and strong foundation bed like those of an iron planing machine. The table has a longitudinal traverse movement in the direction of the length of the timber to be cut, and the two sides upon it have a simultaneous traverse at right angles to the motion of the table. The drawing of the form to which the wood is to be cut is prepared with ordinates or transverse measuring lines (on a template table which is a fixture upon the lower bed plate) at regular distances asunder. When a proper piece of wood has been duly clamped down on the machine, the operator measures off the curvature indicated by the drawing through the agency of these ordinates, and then transfers the guide thus obtained to the template table. When all the ordinates have thus got their set pieces adjusted, a piece of thin metal is threaded along the grooves of the holding sets, so as to reproduce the exact curve of the drawing. The combined slide rest carrying the wood is connected with this curved bar or pattern guide, so that, as the supporting table traverses along, the wood is compelled to traverse laterally in strict accordance with the pattern curve. Hence, as the saw works in its cut, the exact bend in one direction is sawn out in the wood. For the curve in the other direction a second pattern guide or matrix is necessary.

MORTON, G. *Improvements in escapements for chronometers and other time-keepers.* Dated Oct. 17, 1856. (No. 2432.)

The patentee makes the escape wheel of steel, with the teeth of the same shape as the clock "recoil escapement," and the impulse is given to a pallet on the balance staff, as in the ordinary chronometer; but instead of locking the escapement by the detent spring, the escape wheel is locked on the outer and inner flanches of a hollow cylinder cut nearly half way through. On the extremity of each flanch of the cylinder rubies are inserted, for the wheel teeth to rest upon when locked. The locking and unlocking is performed by a ruby, shaped like the teeth of a spur-wheel, carried by a roller fixed on the balance axis, which works between two steel-tempered pins. These pins are inserted in a steel lever or arm fixed on the cylinder axis, and pointing towards the balance staff.

NEWTON, A. V. *Improvements in the manufacture of tufted pile fabrics.* (A communication.) Dated Oct. 17, 1856. (No. 2434.)

The fabric to which these improvements refer is composed of tufts of yarn to form the figuring pile, and held by a linen warp and weft to form a back resembling the back of

tapestry Brussels carpeting; and the invention consists of certain machinery for manufacturing them.

SMITH, J. *Improvements in heating the feed-water of steam boilers for marine and land purposes.* Dated Oct. 17, 1856. (No. 2436.)

This consists in passing the flue of the furnace through the cistern in which the feed water is contained. The flue has a series of metal tubes which pass through it, and the cistern is furnished with partitions which divide it into several chambers, through all of which the water circulates.

LISTER, S. C., and W. TONGUE. *Improvements in spinning.* Dated Oct. 17, 1856. (No. 2437.)

Hollow spindles are made to run on a fixed pin, the flyers being so attached that they can be removed when the bobbin is full. Another method is, to have the spindle running in a hollow tube, so as to be supported nearly the entire length in that case. With high speeds it is difficult to stop the spindles without straining them; to obviate this, a small pin is placed so that the spinner can stop, or partially stop them, by pressing the pin surface, which may be covered with cloth or leather against the spindle.

FRANCE, J. R. *Improvement in electric telegraph apparatus.* Dated Oct. 17, 1856. (No. 2438.)

This consists in suspending the tongues or arms of electro-magnets by magnetism, and in removing the tongues or armatures from electro-magnets by means of permanent magnets; also in an improved method of constructing electro-magnets by which the residual magnetism is reduced; also in a method of arranging instruments or contact makers for working branch lines.

MAGNAY, F. A., and R. R. WHITEHEAD. *Improvements in damping paper for printing.* Dated Oct. 17, 1856. (No. 2439.)

According to one part of this invention, a series of felts or felted fabrics are employed. The dry paper (several sheets together) is piled between the felts which are moistened with water, by which a pile is produced consisting alternately of wet felt and paper. On the upper layer of felt, a board and weight or pressure is applied. Or an endless felt or felted fabric may be caused to move on rollers, the lower roller being in water, so that the endless fabric in its movement may bring up a quantity of water. The paper is fed on to the upper surface of the felt, and is carried by it between two pressing rollers.

PALMER, W., jun. *Improvements in roof candle lamps for railway and other carriages.* Dated Oct. 17, 1856. (No. 2440.)

In the improved lamps the air passes downwards at the outside of the lower part of the glass chimney, and inside a cylindrical gallery or glass holder. The upper part of the glass chimney passes through a reflector disc, the opening through which fits as closely as may be around the chimney. Above the reflector is a large chamber, closed at top, into which chamber the products of combustion flow from the chimney, and thence escape by holes.

COLLYER, R. H. *Improved method of manufacturing paper.* Dated Oct. 18, 1856. (No. 2442.)

To all or any of the substances ordinarily used for making paper, the patentee adds the fibrous portion of the beet root or of mangold wurtzel.

MIRIMONDE, L. J. P. DE. *Certain improvements in reducing the friction of axles and axletrees of carriages on railways.* Dated Oct. 18, 1856. (No. 2443.)

This consists in mounting saddlewise in axle boxes two friction rollers, shaped to correspond with the journal of the axle. Bearings are provided in the axle boxes for the axes of the saddle rollers, which rollers take the bearing of the journal of the axle. To each side of the journal is affixed a ring to which is connected a covering of flexible material. This material dips in an oil reservoir in the bottom of the axle box, and, being carried round with the axle, keeps up a continuous lubrication.

DELCAMBRE, T. *Improvements in machines for composing and distributing type.* Dated Oct. 18, 1856. (No. 2444.)

This invention cannot be described without engravings.

GEORGE, J. *An improved crane.* Dated Oct. 18, 1856. (No. 2445.)

This consists in an improved construction of moveable crane, in which the body to be raised is counterbalanced and its weight ascertained.

DESHAYES, J. F. *Improvements in machinery for dyeing silk, cotton, or wool in hanks or skeins or woven fabrics.* Dated Oct. 18, 1856. (No. 2446.)

This has for its object, 1. To reduce the hand labour required in dyeing textile materials while in the vats. 2. To give to each yarn or staple the same degree of colouring and shade. 3. To economise the colouring matter used, by collecting the excess of dyeing liquids carried away by the hanks when withdrawn from the dye vats. 4. To avoid any alteration in the fibres of the textile material forming the hank in the operation of withdrawing the colouring liquid, which is obtained by means of a single apparatus. 5. To enable any person to perform the operation of dyeing hanks or skeins, and to obtain all the most delicate tints or shades of colours.

HUMFREY, C. *Improvements in the manufacture of grease for lubricating railway axles and other machinery.* Dated Oct. 18, 1856. (No. 2449.)

This consists in making grease for lubrication by combining silica, in the form of silicate of soda, or other alkali, with the matters used in the manufacture of such grease.

HARRISON, J. *Improvements in machinery for warping yarns, part of which improvements are applicable to creels used for other purposes.* Dated Oct. 20, 1856. (No. 2450.)

1. This relates to those creels in which the axes of the bobbins are placed in a horizontal position, the object being to provide against wear and reduce the friction on the bearings on which the axes of the bobbins rest, and consists in lining those parts of the rails or bars on which the bearings are formed with metal, glass, or porcelain. 2. It relates to beam-warping machines, and consists in the application of elastic springs to give increased pressure to the beam upon which the yarn is wound, or to the cylinder which rotates it, and thus increase the adhesion between the two.

KNOWLES, Sir F. C. *Improvements in the manufacture of iron and steel, and in the preparation of fuel used therewith.* Dated Oct. 20, 1856. (No. 2451.)

This invention is described at p. 585 of this number.

YOUNG, J. *An improved ventilator.* Dated Oct. 20, 1856. (No. 2454.)

This consists principally in preventing water (arising from the shipping of a sea on board ship or from any other cause) from descending through the ventilator. The patentee claims the constructing of a ventilator with sloping pieces arranged inside the same and openings in the side of the ventilator, for the purpose of carrying off water.

LACASSAGNE, J., and R. THIERS. *An improved electric lamp.* Dated Oct. 20, 1856. (No. 2456.)

This invention was described and illustrated at page 530, No. 1765.

FORSTER, J. T. *Improvements in the symbols used in signalling.* Dated Oct. 20, 1856. (No. 2457.)

This consists in marking conspicuously the character by which each flag is known on the flag, so that it may be seen from the deck of the ship from which the signal is made. In the same way the characters by which any symbols other than flags are known in the code of signals may be marked conspicuously thereon. It is not intended that the characters on the flags should be visible to the ship to which the signals are made but at close distances.

JENNINGS, J. G. *Improvements in the construction of wall caps, sleeper blocks for the basements of buildings, and bricks to be used as substitutes for wood bricks in building.* Dated Oct. 20, 1856. (No. 2458.)

Caps for walls are formed by forcing the clay through dies by expressing machinery, the dies being formed with cores to produce longitudinal passages through the caps. These caps are by preference glazed. In manufacturing sleeper blocks for the basements of buildings, such blocks are made of clay forced through dies with cores to produce longitudinal openings or passages through the blocks, and in the upper surface of each of the blocks a groove is produced, into which the wood sleeper is introduced. These should also be glazed. In making bricks to be used as substitutes for wood bricks, such bricks are moulded each with a dovetail groove at its end or side to receive a piece or filling of wood.

LORIMIER, A. *An improvement in reworking vulcanized india-rubber.* Dated Oct. 20, 1856. (No. 2460.)

This consists in preparing the waste of vulcanized india-rubber by crushing the same between pressing rollers, then subjecting it to a considerable degree of heat, and whilst so heated causing it to be stirred, by which means the mass is progressively brought into a fluid state. It is then allowed to cool, but before becoming cold a solvent of india-rubber is added, by which an india-rubber cement is produced.

DEACON, H. *Improvements in suspending carriage bodies.* Dated Oct. 20, 1856. (No. 2462.)

In place of using an ordinary perch, two side bars or braces are used, one on either side of the carriage, and they are curved or bent so as to descend between the fore and hind wheels sufficiently to have a step affixed, and it is preferred that the wings should be fixed to such bars or braces. The hinder ends of these bars are fixed directly to the hinder axle, or to a bar which has springs between it and the hinder axle. The back of the body is suspended by two C springs fixed to the hinder ends of the bars or braces, or to the bar which connects them. The fore ends of the two bars or braces are each fixed to a horizontal bar, which is supported by two half elliptical springs placed back to back, and secured to a frame which turns on the pin of the locking motion. The front of the body of the carriage is suspended to two C springs, the lower ends of which are attached to the bars, which are fixed to the fore ends of the side bars or braces, and the C springs rest on the central parts of the elliptical springs.

CLAY, W., and J. HARRIS. *Improvements in the manufacture of iron and steel.* Dated Oct. 20, 1856. (No. 2463.)

These relate to the conversion of the crude metal (while in a molten state) by currents of air caused to pass over or through the metal. To enable the workman to watch the operation, the furnace admits to view a portion of the molten metal in the hearth, and dipping into this hearth is a portion of the furnace wall, which, when a charge of molten metal is run into the hearth, will form with the metal an air-tight (after the plan of an hydraulic) joint. The air is drawn through the furnace by an exhausting apparatus.

BRIQUELER, C., jun. *The purification, clarification, and discolouration of the cotton seed oil.* Dated Oct. 21, 1856. (No. 2454.)

By ordinary means the patentee titures and squeezes out the cotton seed. The cakes of that seed are used as manure. The oil obtained must be warmed and treated with alkali oxide in large tubs, then he adds to it a quantity of water, then steam is introduced in the mixture, and after a few hours the purification is finished. A deposit is formed at the bottom of the tubs, and when the oil is lightly clarified, it has become more fluid and can then be entirely discoloured by the soluble submuriate of soda, of potash, and of lime. It is next treated with a solution of submuriate of lime, then agitated, then treated with sulphuric acid, allowed to stand, and filtered.

MARTIN, J. C. *An improvement in glazing paper.* Dated Oct. 21, 1856. (No. 2466.)

This consists in glazing paper in any length, by adding on the exterior of ordinary rolls continuous surfaces or endless coverings (one within the other when more than one is used) of larger diameter than the rollers, these surfaces being composed of material capable of imparting a glaze to paper, and so as to form endless glazing papers.

BLAIR, G. *Improvements in the manufacture of looped fabrics.* Dated Oct. 21, 1856. (No. 2467.)

These relate to the production of a peculiar description of looped fabric by means of two distinct sets of looping threads, one set acting mainly to form one surface of the fabric, whilst the other goes mainly to form the other surface, and whereby two sets of ribs or loop whales are formed back to back, by each set of threads alternately crossing the other to form, by their looping together, the ribs or loop whales of the opposite surface of the fabric. Other improvements are comprised in the invention.

FONTAINEMOREAU, P. A. L. DE. *An improved knitting loom.* (A communication.) Dated Oct. 21, 1856. (No. 2468.)

This consists in the construction of a rectilinear knitting loom for stockings, &c., in which loom almost all the mechanism of the circular plate loom is employed.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

ROGERS, E. *Improvements in apparatus for the decomposition and combustion of fuel.* Dated Oct. 17, 1856. (No. 2423.)

This consists in decomposing the fuel, or extracting the gases therefrom, in a separate chamber, and causing such gases to pass from the chamber into the furnace.

BRÉCHEUX, N. *Improvements in looking-glasses, applicable especially for dressing-rooms, and for other purposes.* Dated Oct. 17, 1856. (No. 2431.)

The improved looking-glass consists of a piece of silvered glass placed in a suitable frame, the reflecting surface being either flat, convex, or concave.

HENLEY, T. F. *The employment of certain substances not hitherto made use of for the production of alcoholic spirits, and for the manufacturing of the same, the refuse material being applicable as a food for cattle.* Dated Oct. 17, 1856. (No. 2433.)

The substances employed are the various descriptions of weeds of the sea coasts, such as sea wrack, kelp weed, Irish moss, &c.

GOSSAGE, W. *Improvements in the manufacture of coal-gas used for illuminating purposes.* Dated Oct. 17, 1856. (No. 2435.)

The inventor separates hydro-sulphuret of ammonia from crude coal gas by cooling, and thereby obtains liquor containing hydro-sulphuret of ammonia; and he completes the separation of the hydro-sulphuret of ammonia, and also effects the decomposition of sulphuretted hydrogen present in the crude coal-gas, by the use of sulphurous acid.

LAWES, T. *An improved construction of agricultural implement to be used in tilling the land.* Dated Oct. 17, 1856. (No. 2441.)

The cylinder containing the tines or teeth of a tilling machine are raised and lowered (so as to discontinue the tilling, or enable the machine to be turned round, when necessary) by a framework of wood enclosing an iron cylinder provided with arms at each end, through the centre of which a horizontal shaft or axle passes. The surface of the cylinder is provided with tines, and an eccentric wheel is firmly keyed on each end of the shaft for raising or lowering the machine when necessary.

BROWN, H. *An improvement in spinning worsted.* Dated Oct. 18, 1856. (No. 2447.)

This consists in employing flyers when spinning worsted yarn with hollow limbs, and in retaining the fibres from the action or pressure of the atmosphere.

FLOCKTON, T. *Improvements in the consumption of smoke.* Dated Oct. 18, 1856. (No. 2448.)

This consists in the use of hollow fire

bars or pipes. The smoke and gases from the green coal pass into and through the heated fire bars, and thence into the flues.

BROOMAN, R. A. *Improvements in farthingales or petticoats.* (A communication.) Dated Oct. 20, 1856. (No. 2452.)

This consists in forming the circles for expanding the dress, each of a single strip of steel, the two ends of which unite in front by means of slides, in order to expand or contract each band, and thereby make the farthingale more or less full. The hoops are held together by tapes extending from the waist to the bottom. Each hoop, from the waist downwards, is greater than that above it. To two of the side tapes are attached oilets through which a cord is run, to enable the wearer on pulling up the cord to raise the petticoat at either side desired. Another improvement consists in attaching tapes to cause the fulness of the petticoat to set well back, and prevent too great protrusion in front.

HUTEAU, L. P. *An improved petticoat.* Dated Oct. 20, 1856. (No. 2453.)

This consists in the mode of employing steel springs or hoops for the construction of elastic petticoats. They are first covered with a preservative composition, then with thick cotton cloth, and are attached parallel to the petticoat.

FREEMAN, C. R., and W. D. KEY. *Improvements in manufacturing food for animals.* Dated Oct. 20, 1856. (No. 2459.)

This consists in combining the ground product, or an extract of the algarobus (or the locusts of Palestine) with the ground products of rice, sago, barley, rye, Indian corn, linseed, beans, and peas, or some of them, with or without other matters.

PARSONS, W. *Improvements in generating and employing steam in steam engines.* Dated Oct. 20, 1856. (No. 2461.)

A boiler is employed, so arranged that the products of combustion may be withdrawn by pumps actuated by the pistons of steam cylinders, and forced into the water in the boiler, and the steam, having worked in the cylinders which actuate the pumps, is worked by expansion in the same or other steam cylinders.

THOMPSON, H., and T. CURTIS. *Improvements in healds or heddles.* Dated Oct. 21, 1856. (No. 2465.)

This consists in manufacturing healds or heddles of wire, or thin plates of metal, through which eyes or holes are formed for the warp threads to pass. These wires or thin plates are secured above between two plates, the lower one of which has notches to receive their hooked ends. Their lower ends fit loosely between two plates, or in a groove in a single plate; by this arrangement the lower ends of the wires or plates are free to move laterally when drawing in the warps, or for piecing an end, or for other purposes. The plates for supporting the wires or thin plates are connected by end pieces so as to unite the whole together.

PROVISIONAL PROTECTIONS.

Dated March 20, 1857.

778. Joseph François Maire, of Paris. An improved cooking-apparatus, producing a saving of fuel and time.

Dated March 30, 1857.

874. John Horace Taylor, of Alma-street, Hoxton, engineer. Improvements in apparatus for regulating the flow of fluids, applicable to water-closets and other similar purposes.

Dated April 30, 1857.

1213. Henry Ball, gun-maker, of Birmingham. Improvements in repeating and other fire-arms.

Dated May 5, 1857.

1268. Louis Le Chevalier Cottam, of Winsley-street, Oxford-street. Improvements in stable-fittings.

1270. William Wilkins, of Wapping, wire-rope maker. An improved method of laying submarine telegraph cables.

1272. Henry Elliott Hoole, of Sheffield, stove-grate manufacturer. Improvements in stove-grates.

Dated May 19, 1857.

1403. Charles Reeves, of Birmingham, manufacturer. New or improved grinding and polishing machinery, to be used in the manufacture of knives, matchets, swords, and other similar articles.

1409. John Watson Burton and George Pye, of Ipswich. An improvement in pressing and crushing flax, hemp, and other fibrous substances.

Dated May 20, 1857.

1415. Paul Ingwersen, doctor in law, of New Oxford-street. A certain remedy to prevent and dissolve the deposits in boilers and steam generators. A communication from J. Scheibl, of Pesth, and J. Offermann, of Brünn.

Dated April 22, 1857.

1448. William Hensman, of Linslade, Buckingham, agricultural-implement manufacturer. Improvements in drills for sowing seeds and depositing manure.

1449. John Ralph Engledue, gentleman, and William Cullis, joiner, of Southampton. Improvements in ventilators for ships' cabins, apartments, and places.

Dated May 27, 1857.

1481. James Edgar Cook, of Greenock, N. B., booking clerk. An improved composition for the prevention of the decay and fouling of ships' bottoms and other exposed surfaces.

1485. William Stettinius Clark, of High Holborn. Improvements in printing-presses. A communication.

1487. William Stettinius Clark and Benjamin Moore, of High Holborn. Improvements in churns for producing butter. A communication.

1489. Robert Parkinson, of Blackburn, cabinet-maker, and John Standish, of the same place, machinist. Improvements in machinery or apparatus used in the preparation of cotton, wool, flax, or other fibrous materials to be spun.

1491. William Irlam Ellis, of the Vulcan Foun-

dry, near Warrington, Lancaster, engineer. Certain improvements in steam engines.

1493. Robert Low, engineer, of Woolwich, and William Press, of Stepney Causeway. A certain new improvement or new improvements in the construction of vices.

1495. Edward Welch, architect, of Penge, Surrey. Improvements in fireplaces and flues, and apparatus connected therewith.

1497. Jean Léonard Codet-Négrier, of Paris, merchant. Improvements in the manufacture of boots, shoes, harness, and other articles.

1501. John Williamson and Francis Williamson, of Keighley, worsted-manufacturers; John Wright, of Griffe Mill, Haworth, factory manager; and Joseph Wadsworth, of Oldfield, overlooker; all in Yorkshire. Improvements in looms.

1503. Ferdinand Jossa, of St. Helen's Colliery, near Bishops Auckland, Durham. Improvements in hammers worked by atmospheric pressure.

1505. Milivoï Petrovitch, lieutenant-colonel, of Belgrade, Principality of Servia. The improvement of projectiles used with fire-arms.

1507. Thomas Taylorson Jopling, of Dunning-street Foundry, Sunderland. Improvements in water gauges of steam boilers.

1509. Richard Edward Hodges, of Southampton-row, Bloomsbury. Improvements in gauges and scales.

1511. William Edward Newton, of Chancery-lane. An improved method of applying photography to the use of engravers. A communication.

1513. Thomas Hart, of Watt's-terrace, Old Kent-road, agent. Improvements in the manufacture of lamp-glasses, applicable to railway carriage and other lamps.

Dated May 28, 1857.

1515. Alexander Simpson, of Chancery-lane. A new or improved slop and toilet-pail. A communication.

Dated May 29, 1857.

1519. Jean Salles, of Paris, gunsmith. An improved apparatus for printing and stamping.

1521. James Merrylees, of Paisley, N. B., manufacturer. Improvements in the manufacture or production of carpets and other ornamental fabrics.

Dated May 30, 1857.

1525. Pierre Benoit Chapuis, of Lyons, engineer. Improvements in machinery for manufacturing ribbons, trimmings, fringes, and healds.

1527. Moses Clark, engineer, of St. Mary's Cray; Henry Oldfield, millwright, of Foots Cray; and William Salmon, paper-maker, of Foots Cray. Improvements in machinery or apparatus used in the manufacture of paper.

1529. Lewis Fenton Kenny, of Stanley-street, Pimlico. Improvements in window-frames and sashes.

1531. Ralph Errington Ridley, of Hexham, Northumberland, gentleman. Improvements in the permanent way of railways.

1533. Ferdinand Charles Warlich, of Hope Cottage, Kentish Town. Improvements in generating steam.

1535. George Hornsey, of Southampton, gas-fitter. Improved apparatus for the engine-rooms of steam-vessels for communicating signals and orders from the captain on deck to the engineer or attendant below.

Dated June 1, 1857.

1538. Lazare Prosper Lambert-Alexandre and Louis Pierre Felix Mallet, of Paris. Improvements in machinery for propelling vessels.

1539. Frank Perks Fellows, of Wolverhampton, brassfounder and manufacturer. Improvements in the manufacture of hinges, cocks, and other jointed articles, or articles of which one part is required to be capable of turning upon or in another part of the same article.

1541. John Aiken Salmon, of Glasgow, engineer. Improvements in steam engines, and in apparatus for feeding boilers, and in furnaces.

1542. Louis Laurent Bequemie, of Paris, gentleman. Improvements in cocks. A communication.

1543. George Tingle, of Northwood, near Hanley, Stafford, merchant. An improvement or improvements in machinery for the manufacture of articles from clay and other plastic substances.

1545. Henry Thompson, of Regent-street, pianoforte-manufacturer. Improvements in pianofortes.

1546. Thomas Slater, of Hull. An improvement in ploughs.

1547. Stanislaus Hoga, of Marylebone-street. An improvement in coating the surfaces of the cells of galvanic batteries, and also the surfaces of crucibles.

1549. Henry Laurent Muller, jun., of Paris, printer. A new means of advertising.

Dated June 2, 1857.

1551. William Stettinius Clark and Benjamin Moore, of High Holborn. Improvements in animal traps.

1552. Peter Armand Lecomte de Fontainemoreau, of London. Improved means of floating submerged bodies. A communication.

1553. Newton Bentley, of Salford, Lancaster, engineer, and John Alcock, of Little Bolton, said county, millwright. Improvements in machinery or apparatus for forging and stamping metals, which is also applicable to pile-driving, crushing ores and seeds, beetling and fulling woven fabrics, and other similar purposes.

1554. James Allen and John Gibson, of Manchester, brassfounders. An improved union joint.

1555. James Stevens, of the Darlington Works, Southwark Bridge-road. Improvements in water gas-meters.

1556. Nicolino Corrado, of Cardington-street, Hampstead-road. Improvements in purifying fatty matters.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1612. John Gedge, of Wellington-street South, Strand. Improvements in constructing gas retorts in the furnaces of steam engines, or other furnaces. A communication from N. Delannoy, of Tournay, Belgium. Dated June 9, 1857.

1617. Thomas Hale, of Massachusetts, U.S. A new and useful or improved apparatus for heating and ventilating a building. A communication from J. Sawyer. Dated June 9, 1857.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," June 16th, 1857.)

297. W. H. Holding and J. R. Casbay. Improvements in the manufacture of soap.

301. J. F. Dudebout. Certain improvements in looms for weaving.

308. J. Hunt. Certain improvements in shovels and spades for general use.

351. C. Crickmay. Certain improvements in breech-loading guns or pistols for military and other purposes, and which said improvements are applicable and will admit of being applied to guns or pistols now in use.

354. J. N. V. Cadiat. The application of centrifugal force in purifying minerals or any other similar hard substances by washing.

355. J. Skertchly. Improvements in and in the manufacture of saggers.

356. W. Greenslade and J. Wood. Certain improvements in brushes especially applicable to painters' brushes.
361. R. A. Brooman. Improvements in measuring the capacity and contents of casks and other similar vessels, and in instruments or apparatus employed therein. A communication.
367. J. Taylor. Improvements in machinery for crushing various substances.
368. H. Cartwright. Improvements in the application and mode of working eccentrics on steam engines.
372. D. F. Wright. Improvements in the mechanical arrangement for raising and forcing of water or other fluid, air, or gases.
376. H. Willis. Improvements in organs.
377. W. T. Walker. Improvements in apparatus used in gas-works for exhausting, forcing, transmitting, and regulating the flow of gas, and cleansing and warming gas apparatus.
378. A. Stokes. New or improved machinery to be used in the manufacture of nails, pins, screws, and other similar articles.
384. W. R. Hodges. Improvements in the manufacture of an elastic material, and of its application to certain purposes.
387. A. F. W. Partz. An improved method of evaporating fluids, condensing and absorbing vapours, gases, and fumes, arresting and precipitating flocculent metallic or other particles, and transferring heat from air or steam to fluids and pulverulent substances.
393. R. A. Brooman. An improvement in or addition to the locks of fire-arms. A communication.
400. W. Todd and J. Todd. Certain improvements in power-looms for weaving.
410. P. H. Desvignes. Improvements in machinery for preparing flax, hemp, and other fibrous materials.
422. C. Crossley, D. Leeming, and J. Crossley. Improvements in apparatus for heating, and in taps to be employed in combination therewith, which taps are also applicable for general purposes.
437. A. B. Walker. An improved apparatus for heating fluids.
438. H. H. Fulton and T. B. Etty. Improvements in the generation and application of steam power for propelling, hauling, driving, or conveying, particularly applicable to farming purposes.
448. W. E. Newton. Improved machinery for manufacturing nuts and washers. A communication.
498. J. R. Crook. An improved material for, and an improvement in the manufacture of, hat-tips, which material is also applicable to the manufacture of hat and other boxes or cases.
531. J. H. M. Maissiat. Improvements in dibbling machinery for depositing grain and manure.
536. C. F. Latruffe. Improvements in heating apparatus.
583. W. E. Newton. Improved valve gear for reciprocating steam engines whose power is applied directly by the piston without employing a rotary shaft. A communication.
595. R. A. Brooman. An improvement in the manufacture of sulphate of soda. A communication.
611. W. Poupard. An improvement in buttons and means of fastening buttons to garments and fabrics.
625. W. E. Newton. Improved machinery for removing snow from railways. A communication.
677. F. S. Hemming. Improvements in the manufacture of railway chairs and sleepers.
687. W. E. Newton. Improved machinery for cutting screw threads. A communication.
694. F. A. Fitton. Improvements in certain machines for preparing, spinning, and doubling cotton and other fibrous substances.
839. C. Cowper. Improvements in the manufacture of shot and shells for rifled ordnance. A communication.
894. R. A. Wright and L. J. Fouché. A new apparatus destined to produce chemical decompositions by means of superheated steam and water.
973. J. T. Pitman. Improvements in apparatus called fire escapes. A communication.
1138. W. Robertson. Certain improvements in machines for preparing to be spun cotton and other fibrous materials.
1192. W. Ager. An improved mode of hulling and cleaning rice.
1238. H. Levy. Improvements in moleskins, velveteens, cords, and such like materials.
1287. E. Ziegler. A substitute for animal charcoal, applicable also as a colouring matter.
1309. W. Hebdon. Testing the strength of woollen cloth, linen, and all other woven fabrics, also of every description of material upon which a strain can be exerted.
1316. H. Hobbs and E. Easton. An improved mode of preventing the incrustation of steam boilers.
1327. A. V. Newton. Improved machinery for cutting veneers. A communication.
1380. W. Marriott and D. Sugden. Improvements in heating press plates for pressing woollen, worsted, cotton, silk, or other fabrics, paper, and other articles.
1381. R. A. Brooman. An improvement in the construction of oil cans. A communication.
1443. W. Hensman. Improvements in drills for sowing seeds and depositing manure.
1447. F. Walton and J. Pinson. New or improved machinery for stamping or raising metals.
1511. W. E. Newton. An improved method of applying photography to the use of engravers. A communication.
1521. J. Merrylees. Improvements in the manufacture or production of carpets and other ornamental fabrics.
1539. F. P. Fellows. Improvements in the manufacture of hinges, cocks, and other jointed articles or articles of which one part is required to be capable of turning upon or in another part of the same article.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the Gazette in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1299. Thomas Wilson and John Hadley.
1303. John Davie Morries Stirling.
1318. George James Hinde.
1349. Robert Reeves.
1462. Jean André Cecile Nestor Delpech.
1519. Victor Gustave Abel Cuvier.

LIST OF SEALED PATENTS.

Sealed June 12, 1857.

2963. John Smith.
2965. John Metcalf.
2976. Charles Frédéric Vasserot.
2980. Frederick William Gerhard.

2988. John Platt.
35. Thomas Forsyth.
151. Nicolas Fortune.
648. John Woodley and Henry Herbert Swinford.
929. David Joy.
1059. Alfred Vincent Newton.
1091. Gabriel Arthur.

Sealed June 16, 1857.

2975. William Austin.
2995. Francis Barber Howell.
3003. John Brown.
3018. Thompson Newbury.
3028. Thomas Lyon Thurlow.
3035. William Smith.
3062. David Macdonald.
3082. George Ritchie.
389. John Forrest Watson.
886. John Henderson.
863. William Ross.
1069. Thomas Richardson and Manning Prentice.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

J. Newton.—We should judge from your letter that Stationers' Hall is the proper place for you to apply at for protection, which is obtained, we believe, by simply lodging half-a-dozen copies of the matter to be protected. We recommend you to apply at Stationers' Hall for further information.

H. D. Trinidad.—We shall be glad to receive the papers, and to insert them, if found of sufficient merit.

Articles and Correspondence designed for insertion in the ensuing Numbers of the *Mechanics' Magazine* must reach the Office by the Tuesday of each week, at the latest. It is highly desirable that they should be forwarded earlier, if possible.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris: Puckle and Kendrick, Birmingham; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1768.] SATURDAY, JUNE 27, 1857. [PRICE 3D

Edited by R. A. Brooman, 166, Fleet-street.

HOLCOMB'S SUBMARINE CARRIAGE WAY.

Fig. 1.

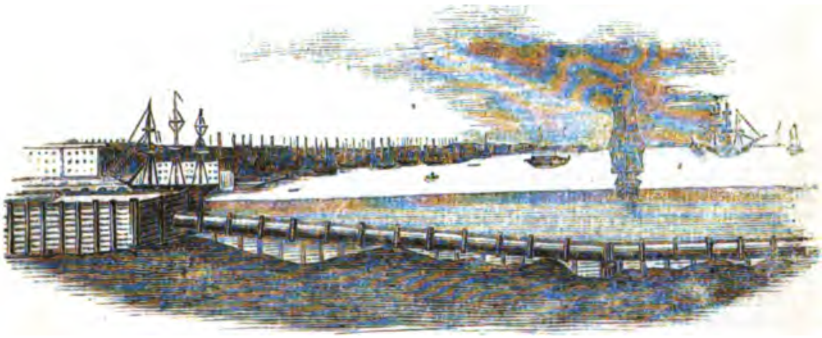
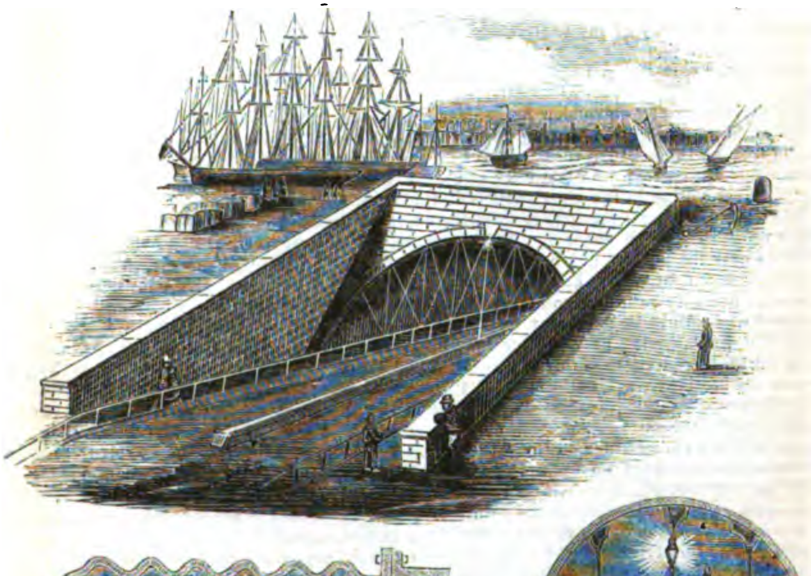


Fig. 2.



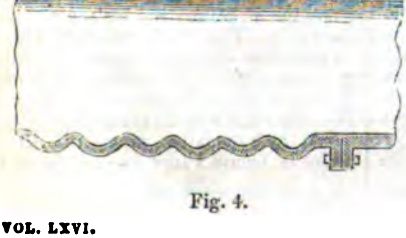


Fig. 4.

Fig. 3.

HOLCOMB'S SUBMARINE CARRIAGE WAY.

The accompanying figures illustrate a design by H. P. Holcomb, C.E., of Winchester, Georgia, for a submerged viaduct or tunnel, adapted to the passage of rivers or other narrow waters, where the purposes of navigation or other difficulties render the common elevated bridge inconvenient or impracticable. This plan proposes a tube of either wrought or cast iron sunk in the water, and conforming somewhat to the general profile of the bed of the stream, being sufficiently low to allow shipping to pass over in the usual channel. As the tube approaches the shores it will ascend on an easy inclination, and pass out of the stream with its upper side at low-water mark, into abutments of masonry.

Mr. H. proposes a cylindrical tube of twenty feet diameter. About one-third of this would be occupied with ballasting of stone, which would, at the same time, form a double roadway for traffic in each direction, while in the curves of the cylinder on each side would be placed the footways, suspended by rods, attached to the cylinders above. Fig. 2 is a cross section of the cylinder or tube, showing this arrangement; while fig. 3 is a view of one of the entrances.

He proposes to place the abutments, say one hundred feet inland, at which point the depth of the open approach would not exceed fifteen feet, having reference to a tidal range of six feet. Mr. Holcomb, who is an experienced civil engineer, holds that the cost of this plan, as compared with tunnelling under the bed of a stream, as in the case of the Thames tunnel, would be trifling, and greatly less than an elevated bridge adapted to such situations. The cause of the failure of the Thames tunnel as a work of utility, is the great depth at which the termini were necessarily laid, rendering the approaches extremely costly, and ingress and egress very difficult—so much so, that the entrances for vehicles have never been constructed. The plan in question removes these difficulties entirely.

The designer writes us as follows:

"I propose, at intervals of say 600 feet, to drive a foundation of piles, and to saw them off to an exact level at the proper point, near the bed of the stream. This is a matter of easy accomplishment. I am now constructing a work on foundations of this sort, and, by very simple machinery of my contrivance, saw off the piles at any depth with great precision and dispatch—in this case the foundations consist of 300 piles in each. The pile foundations are seen in fig. 1 (preceding page), which represents one-half of the submarine way.

"To provide for any expansion or contraction of the tube, or any slight settlement or change of form, I propose to corrugate those parts of the tube over the piles, making those parts of iron no thicker than sufficient to bear the pressure of the water, as, being supported on each side by the seat, no other duty would be exacted at these points. With the object of greater expedition in the construction of the tube, I would construct it in sections of, say fifty feet, the several sections to form the complete tube to be bolted together through flanges provided for the purpose. This arrangement may be seen at one point in fig. 1. The seats over the piles would be armed with spikes or points, to secure the tube against lateral movement, by taking hold of the heads of the piles. Of course the ballasting would be in such quantity as to overcome the buoyancy of the tube in the water without loading it beyond what might be necessary for a firm and secure bearing in the seats."

Mr. Holcomb's design provides for braces across the tube at the level of the roadway, which would, of course, be concealed by the pavement. Our artist has represented uprights between the carriage-ways, and has filled the spaces under the foot-ways at each side with stone, both of which modifications may be adopted, if sufficient space can be afforded; but Mr. Holcomb economizes room at both these points by leaving the central portion clear, though with a dividing ridge on the road-way, and allowing the hubs of the wheels to project under the foot-ways on each side. To do perfect justice to Mr. Holcomb's design, which, we may remark, is eminently practical in every feature, the tube should have been represented as supported only at the points where the corrugations are located, the piles at those points serving as piers, so that it would be, in fact, a perfect tubular bridge, with the advantage that the weight of the tube would be almost supported by the water, while the corrugations which are represented larger in fig. 4, allow for any contraction and expansion, and also for any distortion of the tube in locating the structure, and for any unequal settling or slight movement which might occur afterwards. The buoyancy of the tube is the same, whatever the depth of the water above it, except for the very slight compression of the fluid at increased depths, which in this case is too slight to be noticed, and consequently the tendency of the tube to rise may be very readily and positively calculated without reference to tidal action. The weight of the tube itself with its braces and appendages, external and internal, being easily ascertained by calculation or by trial, it is designed to add only sufficient masonry in the interior to secure a sure preponderance of downward force.

The supports or massive seats, located firmly on the piles at the point where the corrugations are represented, will thus be compelled to bear only this slight preponderance, with the addition of the wagons or other matter moving within.

The bottom may or may not be dredged to a tolerably even outline. Our engraving (fig. 1) shows it very irregular indeed; but it might be preferable to remove the elevations, and lay the tube as low as possible, in order to retard the motion of the tide as little as possible, and to allow the whole to be subsequently covered and protected with stone, &c., if desired.

To the good citizens of Chicago we would specially recommend this plan of crossing the Illinois river, as being well adapted to their wants.—*Scientific American.*

THE LEGAL WRONGS OF INVENTORS.

TO HIS ROYAL HIGHNESS PRINCE ALBERT.

Sire,—I am a man with nothing but my brains to rely upon to feed and clothe me, inasmuch as my physical organisation unfits me for hard labour. I can not obtain my living by means of it, and must surely die unless I can live by the other faculties which Providence has bestowed upon me. I am by nature and pursuit a mechanical inventor, and by necessity a patentee, driven to become one by the impossibility of procuring payment of any kind for my brainwork; because, not being a capitalist or a manufacturer, I have no means of obtaining indirect payment, and am therefore driven to seek that direct payment which the law professes to enforce for the benefit of original-minded men who become patentees, and serve mankind by the work of their brains.

It is, indeed, often alleged that patentees do not produce, or but rarely, anything useful. I think I may take credit for not being a useless patentee, inasmuch as I can quote evidence to show that, on account of patents of mine, upwards of six score thousand pounds have been realized in royalties in the last seven years, but without benefit to me. This has not been because I was undesirous to possess the fruit of my own brain, nor was I likely to employ it uselessly, for the lack of it has prevented me from prosecuting many other valuable improvements. I am not a spendthrift, not a drunkard, not a speculator, and have no want of caution, and, moreover, am devoid of ostentation, knowing that were my income never so large I could but wear one coat at a time, and eat but one dinner per diem. I could not be a rider out or diner out, for the love of progress would then, as now, absorb my whole available time in the pursuit of progress. My patents ceased to be my property by reason of circumstances which I could not control; and they who benefited by them, became my persecutors, seeking to embargo my brain, and impede its further exercise for my own advantage.

It has been told me, Sire, that you are the friend of inventors; that you recognise them to be the most important and useful members of the community; that you were mainly instrumental at the Society of Arts in bringing about that change in the law of patents which enables a poor man to procure a patent for the United Kingdom at one-fourth of the cost which, under the old law, procured a patent for England only. It is for this reason that I address myself to you, to lay before you the painful evils that inventors and patentees still labour under, as they always have laboured, in the hope that your influence will be brought to bear to undo a huge amount of grievous wrong, and place inventors and patentees fairly under the protection of an equitable law, instead of holding out to them a mockery, a delusion, and a snare, under the pretext of rewarding them for the labours of their brains.

The granting of a patent, even with the facilities of knowledge of what has been done, furnished by the Patent-office publications, is often worse than useless to the poor inventor. His patent, even though undeniably original, and specified with all the power and skill of language, is of no value till put into use; and the incessant and wearying labour of getting this done, if involving large outlay, few know except the inventors. But if it be a simple thing and valuable, so soon as known it is infringed by men of money power, who can buy what is called scientific evidence; or a surreptitious claim is set up to it, and the poor inventor soon finds that his customers refuse to pay him his royalties unless he guarantees them against lawsuits. His unscrupulous antagonists have no difficulty in guaranteeing, and thus obtain his royalties, and he has no remedy except by commencing a lawsuit against them. Now for a poor man to commence a lawsuit against a rich one is at the outset an absurdity, and especially in patent cases; so he must go about to find some capitalist to join him, to whom he has to give the lion's share, unless he gives the lion's share to his oppo-

nents in preference, being literally bullied according to law out of his property—bullied simply because the law, instead of being cheap and plain, is beset with every kind of cost and difficulty.

The poor patentee, logically clear as to his case, takes his blue books to his opponents, and points out their wrong doing. They reply that Mr. Counsellor Eitherside is of a different opinion, and there the matter remains, unless the poor man can get together money enough to pay a solicitor, fee counsel, and move for an injunction in the Court of Chancery—a sum of money exceeding the original cost of his patent. But the wealthy opponent, or opponents, at the first alarm, retain all the ability of the bar, and overpower him with affidavits of scientific witnesses, all highly fee'd. He must make counter-affidavits, or he is lost; and if he is successful in getting his injunction, he must then go out of the Court of Equity, and fee counsel and scientific witnesses in a court of law, with the peril of utter ruin before his eyes, if by any of the numerous hitches of law he loses his case; and even if he gains it, his wealthy opponents, to whom money is no object, can probably on some pretence move for a new trial, and finally worry him out. So long as this shall be the existing state of the law, patents will not be of value to the inventors, but only to the monopolizing capitalists—the patent mongers; and this condition of things is fraught with another great evil. The mere capitalist does not desire excellence, but only pecuniary profit, and he will try to keep stationary the patent he possesses, without taking the trouble to bring any improvement into use. All the worst evils of monopolies will be perpetuated under the name of patents, which are the only true competitive processes to keep active the law of progress. Take away the inventors from amongst us, and we should be reduced to the condition of Chinese — non-progressive.

You, Sire, know that inventors are benefactors to the community, and that the law which should give them a real and not a mock protection would be an important means of drawing together in one bond the men who work with their brains and they who work with their capital; and that any process which gives gratuitously the gifts of God out of the poor man's brains to the men loaded with wealth, has a direct tendency to revolutionize society, to make the poor man hopeless and the rich man oppressive; and as you have helped to change the old law for the new one in the creation of patents, which I trust is yet further to be amended in good time, so do I earnestly trust that you will give your influence to such a change in the law for establishing the validity of patents as will put the poor inventor on an equal footing with the rich capitalist.

Much is doing to bestow honour upon inventors—dead ones. Their portraits and their models adorn the Exhibition building you have established at Kensington. They are set forth as benefactors, and it would be wise also to give their history as martyrs in the cause of social advancement. And while looking at them, Sire, call to mind the existing martyrs, who, with weary hands and burning brains, cry out to their country for help against deep and oppressive cruelty—men who care not for wealth, save as a means still further to throw forth the storage of their brains—men who make the grandeur of the land, and yet live in all simplicity.

It is well known to you, Sire, that these men pay to the community a large annual sum of money for the privilege of those patents of which a very small number come to practical use, and that after paying all the expenses of the office there is a large surplus left—a patent fund created by patentees. Why should not this fund be applied, in the first instance, to render valid or invalid the patents that have been paid for and created, without further cost to the patentees? It has sometimes been alleged that patents should be examined before granting, and refused at the option of examiners. But this has been found an impracticable process in the United States, after a course of trial through many years. For many reasons the inventor should have his patent granted him, if he persists, after having had fairly pointed out to him its want of originality, if that be the case. An inventor has not always a logical brain, and it should not be left to him even to imagine an injustice in the legal authorities. But an invalid patent is an evil and a mischief, and a source of litigation in which three parties are concerned—the patentee himself, the individual who may be impeded by it in his operations, and the public; and it is a course pregnant with mischief that it is left to individuals to abate the evil by the costly process known as *scire facias*, abolishing the patent, and which, be it remembered, is also an instrument of great oppression on the part of unscrupulous wealthy individuals. In many cases the law takes prosecutions which have a tendency to become persecutions out of the hands of individuals, and vests them in a public prosecutor; and this question of the validity or invalidity of patents is precisely one of them. Patents are granted for the benefit of the public in order to stimulate the inventor's faculty;

at the cost of the inventors, and out of these surplus costs there are abundant means to maintain a special court of patent judicature.

Before such a court it should be competent for any person to appear and give evidence for or against the validity of a patent immediately on its specification; and the patentee should be enabled, either in his own person or by his representative, to show good cause why his patent should not be struck off the record; and it should be competent for the court to summon witnesses when required, but not at the cost of the inventor, whose paid fees have already entitled him to the protection of the court, if his cause be just. This simple process would dispose of a large source of litigation. The validity of patents thus established, the oppressive man, or man of wealth, would lose much of his present unfair advantages.

In cases of infringement the same process could take place. Competent judges, highly paid out of the patent fund, could do substantial justice with summary jurisdiction, and could be armed with authority to visit with fines any cases of manifest oppression, helping to remove the stigma conveyed in the well-known saying, "that the law is open to every one on the condition of the London Tavern—high payment."

The lowering the price of patents has, to a certain extent, helped the inventor with one idea, but it has put a larger additional tax on the inventor of more comprehensive brain. To these men patents are far more costly than before. They had to pay some £120 for their English loaf, but it was a large loaf of many slices. They now pay some £30 for their United Kingdom loaf, but it has only one slice, which is paid for at a much heavier rate. It is retailed at retail price; but this is not the greatest grievance. The monster grievance is the selling a fictitious commodity. The £30 legal expense, or first cost, may swell to as many thousands, by after costs, in establishing validity; and, what is worse, consume the time and energy of the inventor, that could be profitably employed, instead of wasting it in tracking the course of legal quibbles.

Take any case of a contested patent which has to be decided upon the merits of the specifications; there is scarcely one that the whole of the witnesses could not decide upon in twenty-four hours. Questions of fact must, of course, be dealt with in other ways; but the summary jurisdiction of the court could easily get out of the reach of special pleading concerned in trying to prove falsehoods. Scientific witnesses, as they are called, should be called by the court, and the trading in evidence would soon become disreputable when brought before the keen scanning of pure and upright judges. Justice would be done, and it would be done quickly, when men of talent or capital ceased to find an interest in delay.

And now, Sire, as to this quality called justice. It is the general belief in this which holds society together. But if once there grows up a general perception that there is a conspiracy on the part of those who hold the material wealth as private property, to make common stock of the inventive brains that multiply and make more available that material wealth, inventions will dwindle and disappear. There are writers who call the present condition of the patent laws "a one-sided Socialism." The "haves" take from the "have-nots" at their own will and pleasure, under colour of law, the use of their brains as completely as do the slaveholders of America the physical and other powers of black men. You, Sire, know that this is a condition of things fatal to progress, fatal to all the best interests of humanity, fatal to law, fatal to order, undoing the work of ages, and the proud boast that the humblest born Englishman may by his faculties and gifts rise to the highest position under the Crown. The belief is getting forth that neither genius, nor gifts, nor industry, are now the paths to distinction, but only the possession of wealth, and to that one sordid object is sacrificed the heart and strength of the nation. The belief is getting forth that banking and other huge frauds are but the outward and visible sign of yet greater corruption within; and if law is to continue only a pitfall and a snare, a fictitious semblance of justice, perilous are the phases which the nation will have to pass through to get it righted.

You, Sire, are in the position to become the chief and leader of all the original-minded men of physical progress in the three kingdoms, and of those who come hither from other lands to become Englishmen in the second generation. You can agitate this great question, as to whether the inventive men shall be the real owners of their own brains, or merely honey bees to be smoked out of their hives by law formulas when their honey begins to accumulate. There never was a clearer case. No grant is needed from the nation, for the inventors provide their own funds. They can found a library, they can gather together models, the marvels of the world, they can surround themselves with all appliances that can lighten the primal curse, and under the dispensation of Providence change the

physical sweat of the brow into the intellectual sweat of the brain within the brow. Be, then, the leader in this great cause, make it a household word throughout the length and breadth of the land that the inventors' fund shall be the property of the inventors, to be expended for their progress, and through them for the progress of the nation; and, above all, for the establishment of an Inventors' Court of Judicature where equal justice shall be administered, alike to rich and poor, with premptitude and dispatch, and where the rich man's purse shall not weigh down the poor man's right by the operations of the law's delay. Better would it be for the poor man even to have prompt *in*justice done to him, than to waste his time and energy in the ever slower and slower moving process of legal justice. Better were it to stake his cause at the outset on the gravitation of a revolving coin, than even to win a losing cause in the law courts, where the outlay eats up the verdict.

The work of origination ought to be regarded by the state with jealous care, to ensure the non-molestation of the workers, for the state also is a loser by the impediments thrown in their way. It is origination that keeps up the standard of profits, and preserves the lead before nations that are less originative; that furnishes the tax fund for defence in war and improvements in time of peace.

No deed of greater heroism, Sire, could be done in the days of modern chivalry than to do battle for the right against ancient error—against obsolete laws, that only turn to the profit of dishonest men. Give but the signal, and strength, and will, and intellect will rush to the struggle on all sides, hailing with joy the advent of the time when even-handed justice shall be dealt out without delay. The present system is but the continuance of the deeds of the robber barons of old, not now wielding swords, but wielding laws that turn into as fatal weapons against the peaceful workers. The time is ripe for the change: even the writers of fiction dwell upon the wrongs done to inventors as a popular subject.

Let us, then, hope for the time when, in the Great National Establishment you have planned at Kensington, or elsewhere, an establishment which, if I have understood it rightly, with my imperfect means of knowing, is to contain the germs of all future inventive progress—in that Great National Establishment, there will range, let us hope, side by side with the inventors' library, and model gallery, and gallery of portraits, the New Court of Patent Equity, presided over by clear-headed and upright judges, bent only upon doing justice between man and man, and from whose decision there would be no need of appeal, surrounded as they would be by all the appliances, illustrative and historical, tending to correct judgment.

In the hope and belief that this will come to pass, and that you, Sire, will be the chief and leader of this movement of duty, I subscribe myself "loyally," and with a full understanding of the meaning of this noble word,

R. J.

June 22, 1857.

BETTS'S CAPSULE PATENT.

COURT OF QUEEN'S BENCH, WESTMINSTER, JUNE 20, 21.

(*Sittings at Nisi Prius, before Lord Campbell and a Special Jury.*)

BETTS *v.* MENZIES AND ANOTHER.

Sir F. Kelly, Mr. Macaulay, Q.C., Mr. Udall, Mr. Webster, and Mr. Milward appeared for the plaintiff; Mr. M. Smith, Q.C., Mr. Hindmarch, and Mr. J. Brown for the defendants.

The trial of this cause, which possesses many points of great interest, and which occupied the Court all Friday and Saturday, was not brought to a close until a late hour. The plaintiff, W. Betts, sued the defendants, R. D. Menzies and T. Wildey, to recover damages for the infringement of a patent granted to the plaintiff on the 13th of January, 1849, for "a new manufacture of capsules, and of a material to be employed therein, and for other purposes." The defendants, among other objections, denied the novelty of the alleged invention, and also said that there was no due specification of it.

Previous to the 13th of January, 1849, "capsules" and "tinfoil" were made entirely of tin, which is five times as dear as lead, but, towards the end of 1848, it occurred to Mr. W. Betts, the plaintiff, to endeavour to make them of lead coated with tin. In making experiments he laid a plate of tin on a plate of lead, and passed them between the rollers, and eventually proved that lead and tin could be mechanically united by heavy pressure into one substance. A plate of tin was then placed on each side of a plate of lead, the two plates of tin being together 1-10th and the lead 9-10th of an inch in thickness; and the plates being thus rolled out produced a broad riband of lead, coated on both sides with a brilliant surface of tin, incapable of being acted upon by acids. The new metal thus produced was then cut into discs and manufactured into capsules. The plaintiff completed his discovery on the 27th of Nov., 1848, and the next day petitioned the Crown for a patent; but some little delay took place on the part of the officers of the Crown, so that the patent

was not sealed till the 13th of Jan., 1849. As soon as the invention became known, the capsules, from the reduced price, came at once into very general use, not only in this country, but on the continent; the new "tinfoil" or "Betts's metal" also came into extensive use in a variety of ways. It appeared, however, that soon afterwards the three brothers of the plaintiff (who in 1847, on the death of the father, shared the capsule business with the plaintiff) began to dispute about the patent; and that, while the plaintiff claimed it as his exclusive property, the other brothers claimed a joint interest in it. The defendant, Menzies, had been foreman of the capsule manufactory, and so had become acquainted with the plaintiff's process; but, on the 9th of August, 1849, he was dismissed from the plaintiff's service. A few weeks afterwards he went over to Belgium, and became acquainted with the other defendant, Wildey, who has now a manufactory at Malines, where he manufactures capsules according to a mode which the plaintiff alleged was an infringement of his patent of January 13, 1849. The defendant, Menzies, in October, 1850, returned to England. In the meantime the plaintiff and his brothers had become involved in a Chancery suit on the subject of the patent. The defendant, Menzies, then entered the employ of the brothers; and in the year 1852 a suggestion was made by him in Chancery that the plaintiff's patent was void, because, as he (Menzies) said, in the interval between the petition for the patent, the 28th of November, 1848, and the grant of the patent on the 13th of January, 1849, the plaintiff had sold a large number of capsules to the public made of the new metal. In the year 1852, an action at law was directed by the Court of Chancery to be tried between the plaintiff and his brothers with respect to the validity of the plaintiff's patent; but the action and all the Chancery proceedings were referred to a barrister, Mr. Biggs Andrews, who in 1856 made his award, under which the plaintiff retained the patent, and was directed to pay his brothers from £2,000 to £3,000. During these proceedings the defendant, Menzies, was the adviser and witness of the plaintiff's brothers; but he subsequently renewed his connection with Mr. Wildey, the other defendant. In the year 1854, Wildey took out a patent in Belgium for making capsules in a manner similar to that described in the plaintiff's patent, but expressed, as Sir F. Kelly observed, in more simple and comprehensive language.

Lord Campbell said, that in Belgium they followed the French forms, which were in general most admirable, both for simplicity and precision.

The mode of manufacture adopted by Wildey was described as being a clear piracy of the plaintiff's invention, though he alleged that the articles which he imported into this country, and which the defendant Menzies had sold, were not made according to the plaintiff's method, but according to a method patented by a Mr. Dobbs in this country so far back as the years 1804 and 1820. The plaintiff's witnesses said that Dobbs's patent was not identical with the plaintiff's, the chief difference relied upon being that in the plaintiff's patent the proportionate thickness of the metals was specified, whereas in Dobbs's patent of 1804 the metals were to be "of equal or unequal thicknesses." Evidence was given to show that Dobbs's patent had never been brought into use at all. Several witnesses employed in Wildey's manufactory were brought over, and, according to their evidence, the capsules made by them in his manufactory, and which were proved to have been imported into London and consigned to Menzies, were made in precisely the same method as that described in the plaintiff's specification.

At the close of the plaintiff's case,

Mr. M. Smith submitted that there was no evidence of infringement, and that the plaintiff's specification was bad.

Lord Campbell said, he thought Dobbs's patent was good, as far as it went; but it was not the same as Betts's. His Lordship said he should hold that the plaintiff's specification was good, and that there was evidence for the jury.

Mr. Smith, on the part of the defendants, contended, first, that the plaintiff's patent was clearly bad, for there was no novelty in it, the precise method adopted by him being that specified by Dobbs in 1804; and, secondly, there was no infringement, for the capsules imported into London by the defendant had been made under Dobbs's patent of 1820 by fusion. It appeared that the plaintiff, in his specification, claimed—

"First, the manufacture of the new material, lead combined with tin, on one or both of its surfaces, by rolling or other mechanical pressure, as herein described; and, secondly, the manufacture of capsules of the new material of lead and tin combined by mechanical pressure, as herein described."

Dobbs's patent for making "Albion metal" was dated the 10th of September, 1804, and in his specification Dobbs said:

"The operation of coating or plating lead with tin, or coating or plating alloyed lead with tin, or with alloyed tin, to make Albion metal, I perform by various methods, as hereafter described—that is to say, I take a plate or ingot of lead, or alloyed lead, and a plate of tin, or alloyed tin, of equal or unequal thicknesses, and laying them together, their surfaces being clean, pass them between the rollers of a flatting or rolling mill with what is technically called 'a hard pinch,' so as to make the metals cohere. If, after the first passage of the plates or pieces of metal between the rolls, the plates or pieces do not sufficiently cohere I pass them a second or third time, or more, between the rolls, until a sufficient degree of cohesion is produced."

Several witnesses were called, who stated that the plaintiff's process and Dobbs's were precisely similar, and that they had made a metal under Dobbs's patent which could not be distinguished from that made by the plaintiff. Both the defendants were examined at great length in support of this view, but in the course of the evidence it appeared from a letter written by Menzies to Wildey that neither of them knew anything about Dobbs's patent until a very recent period, and that on making the discovery they were advised that they could safely import the articles into England. A great deal of evidence was given by Menzies to show that before the date of the plaintiff's patent he had sold a large number of capsules made of his new metal, and this evidence was supported by entries made in the books by Menzies, and showing by the weight that the goods in question must have been of the new metal, which was heavier than the old. But, on cross-examination, it appeared that two of these entries had been made on erasures, and from the adding up it appeared that the original entries must have corresponded exactly with the weight of the old metal, which consisted of tin only.

Mr. M. Smith having summed up the defendants' evidence, Mr. Macaulay replied upon the whole case.

Lord Campbell, in summing up the evidence, made some observations which were not very favourable to the defendants' proceedings, and observed that the course taken was a hardship on the plaintiff; but still that consideration must not determine the case, but the jury must say, upon the evidence, whether or not there had been an infringement.

The jury found a verdict for the plaintiff on all the issues, but the defendant obtained leave to move to enter the verdict in his favour.

BROOK AND HIRST'S PATENT FOR FINISHING YARNS AND FABRICS.

COURT OF QUEEN'S BENCH, WESTMINSTER, JUNE 22.

(*Sittings at Nisi Prius, before Lord Campbell and Special Jury.*)

BROOK AND HIRST *v.* ASTON.

Mr. Bovill, Q.C., and Mr. Hindmarch appeared for the plaintiffs; and Mr. H. Hill, Q.C., and Mr. Manisty, for the defendant.

The plaintiffs in this action were woollen manufacturers, at Huddersfield, in Yorkshire; and the defendant, W. H. Aston, was also engaged in the same manufacture at the same place. The action was brought to recover damages for the infringement of a patent granted to the plaintiffs on the 23rd of Feb., 1856, for "an improvement in finishing yarns of wool and hair, and in the finishing of woollen fabrics and piece-goods," which was described at page 403 of the *Mechanics' Magazine* for Oct. 25, 1856, No. 1733.

Mr. Hill objected that the plaintiffs' patent was bad, because it was a patent for producing the result in reference to hair and wool by means of the same machinery as was patented by them in 1853 in reference to cotton and linen yarn.

Lord Campbell said he would reserve leave to the defendant to move on that point. His Lordship intimated that if the plaintiffs' patent was good there was good evidence of an infringement.

The defendant was examined, and denied that he had infringed the plaintiffs' patent. He said he had only used his machine in the scouring process, and that, as he only manufactured "tweeds," which did not require to be "burnished" and "polished," he had no need to use a polishing machine. He said the machine which he had used was "Fulton's" scouring machine, patented in 1823, and that he had paid Fulton a license of £20. to use his machine. He said he paid the £20 to Fulton, not because he had been threatened, but for "conscience' sake." (Laughter.)

Long before the close of the case the jury said they were unanimously of opinion that if the plaintiffs' patent was good, there had been an infringement.

Lord Campbell said he was of the same opinion, but wished the trial to proceed.

Eventually this defence was abandoned; and

His Lordship, in summing up, left it to the jury to say whether or not the process used by the defendant was substantially that patented by the plaintiffs; if so, the plaintiffs were entitled to a verdict.

The jury immediately found a verdict for the plaintiffs, with 40s. damages.

Crystal Sheet Glass.—The colour present in ordinary sheet glass is, as is well known, a great defect, particularly when applied to pictures and to the better kinds of glazing. Mr. Lamb, of Soho, is now importing a very excellent colourless foreign glass, of which we have seen specimens. It is very pure and free from blemishes, and is sold at moderate prices.

A NEW SCIENTIFIC COLLEGE FOR YOUNG MEN.

A new college for the education of young men has been established at Gnoll—a large mansion situated in a park between the Vale of Neath and the Bristol Channel, being, of course, in South Wales. The plan of this college is a most admirable one, and appears to us to afford all the advantages which can possibly be comprised at the present day in an institution of the kind. The founders have laid down a scheme which, if faithfully and skilfully carried out, will offer to the rising young men of this country opportunities for obtaining a higher and sounder culture in science than they have ever yet had placed within their reach. Of course, any educational scheme, however excellent, may be rendered futile by defective management, and we have no further knowledge of the proposed college than is given in a little treatise* recently issued with the view of making its character known. But the publication of a very admirable plan, and a very sensible treatise upon it, affords good ground for high expectations of what is to follow. Remembering the superficiality of much of the scientific knowledge now existing, even among professional men, and knowing, as we do, the alarming waste of time which our existing scholastic and collegiate systems necessitate, we wish every success to Gnoll College.

It is impossible for us—we wish it were not—to give a description of the educational arrangements of this new college. It must suffice to say that it is a very noble one, and of an eminently practical character. No department of science is there to be studied exclusively from books. Book knowledge is to be transmuted into living experience by actual acquaintance with the farm, the mine, the quarry, the ship, the dock-yard, the laboratory, the factory, the observatory, and, as far as practicable, with every branch of actual life. Such of our readers as require further information respecting this institution (which is to be opened in October), had better consult the little treatise before mentioned, which is inexpensive and easily obtainable.

* "The Principles of Collegiate Education Discussed and Elucidated, in a Description of Gnoll College, Vale of Neath, South Wales. A National Institution adapted to the Wants of the Age." London: E. Stanford, Charing-cross. 1857.

AN IMPROVED SLIDE RULE.

Mr. Charles Hoare, whose work on "Mensuration" was reviewed at page 397 of No. 1655, vol. 62, of this Magazine, has arranged an improved slide rule, and published a small book of instructions for using the same.* We learn from the latter that the author's object, in attempting a total revision of the Sliding Rule, has been "to render its operations so connected and apparent, and the estimation of the results obtained so easy and certain, that the difficulties hitherto experienced in the use of this invaluable instrument, and the objections reasonably urged against its practical utility without a thorough re-arrangement, may be for ever removed. Stimulated by the conviction that great benefit would accrue from its general introduction as a frequent substitute for (and a sure guide and check upon) the laborious processes of arithmetical calculation, his undivided attention has for many months been devoted to its improvement." This could only be effected, he states, by entirely re-modelling the instrument.

The advantages of the new Rule appear, from a statement published by the Institution of Civil Engineers, to consist in a thorough revision of the Constants or Gauge Points, which were very clearly and neatly tabulated; in the systematical arrangement of a large amount of useful data for reference; a cleverly adapted Decimal Reducing Scale with a Vernier Reader, by which the equivalent to any given fraction, or the value of any decimal in money, weight, or measure, could be found on inspection; concise formulæ were also engraved below the several tables, giving examples of their application, thus preventing the necessity for trusting to or taxing the memory. The whole design bore evidence of care and excellence, fairly supporting its pretensions to novelty and utility as a Pocket Calculator, adapted to the use of the civil and mechanical engineer, the architect, the builder, the naval and military officer, the schoolmaster, and the artisan.

* "Instructions issued with Hoare's Pocket Calculator; or Improved Sliding Rule: which affords an instant solution to a vast range of Questions in Mensuration and Mechanics. Designed for the use of Civil, Mechanical, and Mining Engineers, Naval and Military Officers, Architects, Surveyors, Builders, Shipwrights, Mathematical Teachers, and for all Intelligent Operatives. By C. Hoare." London: W. S. Johnson, St. Martin's-lane.

The Steam Engine; or, the Powers of Flame. An Original Poem in Ten Cantos. By T. Baker. London: J. S. Hodson, Portugal-street, Lincoln's-inn. 1857.

The perusal of this book—or rather the partial perusal of it, for we have by no means read the whole of it—raises in our minds the question,—Can a man who is no poet write a poem? We are led to this by the fact that, while we ourselves feel perfectly confident Mr. Baker is no poet, he is equally confident that he has written a "poem." He plainly says he has, for even if he is not to be considered the author of his title-page, he must be held responsible for his "preface," and therein he three times makes mention of "the poem," and even informs us that its "plan," which is an important part of it, has been pronounced by gentlemen of high literary reputation as "decidedly original." That they admire its decided originality, he doubtless wishes us to assume; but we reserve to ourselves a private judgment upon that point.

We would not have it supposed that we have read this production with prejudice, or that we review it with any want of geniality. Doubtless the steam engine is a wonderful thing, and has worked wonders. No man can live in a land where the steam train streams through the hills like a rocket through the air, without knowing that he is witnessing the operation of an agency which is as much fitted to excite the imaginations of men as any thunder that ever shook Olympus, or any other phenomenon that ever excited the poetic passions of men. There can be no doubt that the steam engine and its inventors will one day be immortalized in verse. But Mr. Baker is not the Homer of the steam age. He is a man of facts, not of ideas—a narrator of events, not a poet. He gives us a rhymed history of the steam engine and its improvers, and not a poem evoked by these.

In every "poem" we look for something more than facts,—for more even than facts illustrated by images and similes. We look for a delicacy of diction, a sweetness of speech, a lustre of language which is not to be found elsewhere. But we find no evidences of these in Mr. Baker's book. His "Steam Engine" has developed no such graces; we find no such splendours in his "Powers of Flame."

To illustrate what we are here expressing, let us take up the work of any real poet. Here, for example, lies before us Tennyson's "Maud, and other Poems." We open it at random, and read:

"For I trust if an enemy's fleet came yonder round by the hill,
And the rushing battle-bolt sang from the three-decker out of the foam," &c.

We open the "Steam Engine" at random, and read:

"Now busy mills began again to rise;
And towns to grow to an unwonted size."

Again we open "Maud," and read:

"For a breeze of morning moves,
And the planet of Love is on high,
Beginning to faint in the light that she loves,
On a bed of daffodil sky;
To faint in the light of the sun that she loves,
To faint in his light, and to die."

We open Mr. Baker's book, and read:

"There are who, in these wonder-working days,
Their eager hopes so prominently raise,
As to expect Invention's game shall spring,
In future time, on more than eagle's wing."

Once more we open the two volumes, not now at random, but to look for a passage in each on some one subject. Here are two, each of them descriptive of a ship in motion. Mr. Baker says (of the steam vessel *Comet*):

"Bell's splendid *Comet* skimm'd along the Clyde,
And forced its way, defying wind and tide.
He made at once the sons of Glasgow stare," &c.

Tennyson says:

"Where, if below the milky steep
Some ship of battle slowly creep,
And on through zones of light and shadow
Glimmer away to the lonely deep,
We might," &c.

Every intelligent reader must see at once that these writers have nothing whatever in common. In the words of the one you have music as pure as seas ever sang, or birds warbled, while in the other you have commonplaces as prosily put as it is possible to conceive them.

We have said thus much of Mr. Baker's book *as a poem*, because his title-page and preface challenge such criticism. But it would be unfair to abandon the work without saying that, although utterly without merit as a poem, it has merit of another kind. There are thousands of men in this country who have no taste whatever for poetry, but who have a sharp appetite for easy rhymes detailing interesting facts. That large class Mr. Baker's book will suit. It contains a very fair account (in the text and notes together) of the rise and progress of steam power, and we have not the least doubt that many such persons will—notwithstanding all we have said, or might say—esteem the book as a work of great ability and interest, and the writer as quite a man of genius. Let it be so. These men could not read Tennyson if they were paid for it; but they will adore Mr. Baker, and there is no reason why they should not as freely indulge in their delights as we do in ours.

Synopsis of the Patent Laws of Various Countries. By A. TOLHAUSEN, Ph. D., &c. London: Taylor and Francis, Red Lion-court, Fleet-street. 1857.

THIS is a small 80-page pamphlet, giving the following information respecting the Patent Laws of the various States in which patents for inventions are granted: viz., 1. The law, date, and where recorded; 2. Kind of patents granted; 3. Whether a previous examination is practised or not; 4. The duration of patents; 5. Government fees; 6. Documents required and where to be left; 7. Working and extension; 8. Assignments; 9. Specifications, inspection and copies of; 10. Where lists of patents are kept; 11. Where specifications are published; 12. Where the originals of specifications (or models) are kept. This synopsis will be found useful to persons requiring to ascertain these several points at a glance.

Look to your Provisional Specifications. A Word of Caution to Patentees and Inventors. By WILLIAM SPENCE. London: Weale. 1857.

THE author of this little pamphlet, doubtless, meant well in publishing it, and as he confines himself mainly to a restatement of those clauses of the Act of 1852, which relate to the Provisional Specification, he is quite correct in what he recommends. But we do not see the utility of such a publication. It is addressed to patentees and inventors; but if these employ agents of established reputation they will not require the aid of such a tract; and if they do not employ such agents, and are ignorant of the law, we fear Mr. Spence's remarks will not enable them to comply satisfactorily with the requirements of the law.

When Mr. Spence recapitulates the clauses of the Act of Parliament he is correct; but there are remarks in the pamphlet of very questionable value. For example, we have quotations from Butler's "Analogy," Dr. Richardson's Dictionary, Cowper's Poems, and Bailey's "Festus," from the latter to the effect that "Nature means necessity," which is about as tangible a thing as the scene "Everywhere," or that other scene "Elsewhere," which Mr. Bailey refers to in the same wonderful work of imagination. We really see no use whatever in telling a man who is trying to describe the "nature" of an improved steam engine that "Nature means Necessity." Indeed Wordsworth gives a different account of Nature, and represents it as incapable at times of attaining its ends, for he says,

"Nature ne'er could find the way
Into the heart of Peter Bell."

But, more seriously, we fear that however

sound the injunction of the writer—and, by-the-bye, these injunctions which are becoming so common on title pages, appear to us rather more impertinent even than Mrs. Mary Wedlake's celebrated interrogation, "Do you bruise your oats?"—the injunction of the writer will, we fear, be but of little use to those who most requre to give attention to it.

MISCELLANEOUS INTELLIGENCE.

South Kensington Patent Museum.—The Patent Museum at South Kensington is now open to the public, and is well worth the attention of the inventive and scientific portion of our readers. The most prominent model is Symington's patent marine steam engine, of which we gave an elaborate account at page 509 of our No. 1764, for May 30. This will form an object of attraction as long as it exists. Beside this, there are a hundred other models of various kinds, a very large number of which have been contributed by Mr. Woodcroft, to whose zeal the public is mainly indebted for the creditable and interesting character of the museum. We have not space to enumerate and describe the various models and drawings exhibited, and it is not necessary to do so, as the greater part of them will remain permanently where they now are. We hope that the example set by His Royal Highness Prince Albert, Mr. Nasmyth, Mr. Whitworth, Mr. J. Scott Russell, Mr. Fothergill, and other well-known gentlemen, in contributing to this exhibition (which will be much resorted to) will be followed by many others, so that the display may become well worthy of the nation. The Gallery of Portraits of Inventors is not the least interesting part of the South Kensington Museum.

The Royal Yacht. — The Queen of these realms has, as she should have, the fastest and finest steam yacht in the world. The *Victoria and Albert* was built at Pembroke Dockyard, from designs furnished by the Surveyor of the Navy. Her length between perpendiculars is 300 feet, and from taffrail to figure-head 337 feet; her extreme breadth is 40 feet 3 inches; her burden in tons, 2,343. She has engines of 600 nominal H. P., and is propelled by paddle-wheels. When tried at the measured mile in Stokes' Bay, with a draught of water of 14 feet aft and 13 feet 10 inches forward, her engines worked up to an indicated H. P. of 2,980, making 25·4 revolutions per minute; and the yacht attained the unparalleled speed of 19½ miles per hour. Her character for unequalled speed was well sustained on a recent trip from the Isle of Wight to Cherbourg, when she accomplished the journey of 84 miles in 4¾ hours, having started from the spit buoy at 3 h. 17 m. A.M., and entered the harbour of Cherbourg before 8 A.M., thus making nearly 18 miles per hour. She is built upon the diagonal principle, and is therefore both lighter and stronger than either an ordinary wooden or iron-built ship.

Accident in a Dockyard.—An accident occurred last week in the dockyard belonging to Messrs. Money Wigram and Sons, Blackwall, which created great alarm, and threatened to be very serious. The *Blenheim*, a ship of about 1,400 tons belonging to Mr. Smith, was hauled into the dry dock, and by some oversight was allowed to get across the blocks, so that, as the water left her, the after part of the keel grounded upon the blocks, while the fore part continued to fall. This caused the ship to incline, and as there were no means at hand for keeping the water in, the position of the ship became very dangerous. About 200 shipwrights were speedily got together, partly from neighbouring yards, and shores were cut from everything which came to hand, and placed in every available position. A portion of these cracked and gave way, but in a short time they were so numerously and so well placed that the ship became firmly fixed, and held securely until the returning tide floated her, and enabled the men to get her out again perfectly uninjured.

Lowering a Ship in Dock.—An interesting experiment was performed last week upon a ship in dock in Messrs. Green's dockyard, Blackwall. The *Torino*, an iron screw vessel built by Messrs. Mare and Co., and employed on the line between Genoa and South America, got ashore near Rio de Janeiro, and sprang a leak. The owners got her across to Marseilles as well as they could, to undergo repairs; but, finding that the repairs were likely to be six months in hand, they determined to try the English builders, and consequently brought her up the Thames in a very leaky condition, to be docked in Messrs. Green's yard. She was there repaired in one month, and, as numerous applications had been made for the dock, it was desirable to get her out as soon as possible. The tides not being high enough to float her, it was determined to try the bold experiment of lowering her in the dock to suit the tides. She was accordingly suspended by shores, the blocks were removed from beneath her, and replaced by others three inches lower. The shores were then slacked out, and she was allowed to drop down upon the blocks. This operation was repeated twice, and then the block-caps were split out to let her down the remaining distance—altogether about one foot. At two o'clock in the morning two steam tugs laid hold of her, and, after

a short struggle, succeeded in getting her out safely.

Spiritualism in America.—Of all the religious or other systems which have been propagated in the world by the agency of men who have pretended to be the recipients of supernatural revelations, there has been none so boldly advanced as the new heresy of "spiritualism" in America. We have before us the tenth number of the *Banner of Light*, a Boston paper of eight pages, beautifully got up, and containing much really well-written matter. On page 7, there is this heading, "The Messenger," and beneath it this notice:—"Under this head we shall publish such communications as may be given us through the mediumship of Mrs. J. H. Conant, whose services are engaged exclusively for the *Banner of Light*. The object of this department is, as its head partially implies, the conveyance of messages from departed spirits to their friends and relatives on earth." Lower down we read, "One of the most gratifying phases of spirit communion has been found by us to be conversing with unprogressed spirits, or those who, having left the earth life in moral degradation, return to the earth's inhabitants for instruction and aid;" and a Baltimore correspondent writes to say that he and others have classes of spirits, many of whom have improved under their teachings. The editor also gives a message from a spirit to him corroborative of another given by the same spirit in Baltimore, and he further informs his readers that, as his "circle" is open to all spirits, persons in distant cities "may make arrangements with their spirit friends" to commune with them through his columns. It appears pretty plain from the rapid spread of this American spiritualism that Mr. Macaulay was not far from right when he said, "That in spiritual matters there cannot be a progress analogous to that which is constantly taking place in the sciences." It is to be hoped that our religious communities at home will lend no countenance to any practice which can tend to justify these American impostures.

Ingenious Sanitary Arrangement.—Near the Observatory of Washington there has existed, on the banks of the Potomac, a malarious swamp covered with parasitic herbs, the exhalations of which have, on many occasions, produced fever in the neighbourhood. It occurred to Lieutenant Maury (whose name is honourably known in connection with numerous public services of great merit) to oppose to these noxious exhalations plants possessing a considerable power of absorption. He accordingly had planted a quantity of the *heliantus grandiflorus*, and these have been completely successful in absorbing the dangerous gases, and altogether averting the fever visitation from the spot where it had periodically occurred for years.

Helioscope.—Under this title Mons. Porro, the French astronomer, has just constructed a telescope of the Newtonian form, by which he is enabled to observe the sun without the intervention of a piece of darkened glass (which is always difficult to obtain sufficiently pure and free from colour), and without being inconvenienced by the heat, which in instruments of any magnitude soon destroys the darkened glass, and endangers the eyesight of the observer. The excess of light and heat is got rid of by means of three reflectors, suitably arranged. The image of the sun thus obtained is perfectly white and well defined; the intensity of the light can be regulated at pleasure, and the heat is almost nothing at the eyepiece, so that the observer is enabled to work comfortably for many hours.—*Journal of the Society of Arts.*

Allan's Electro-Magnetic Engines.—The French paper *La Presse* of June 20th, contains a very laudatory article upon Mr. T. Allan and his inventions, and makes the success of that gentleman the occasion of some very strong remonstrances against the management of the Academy of Sciences. Let us see, says *La Presse*, what has happened to Mr. Allan, that marvellous inventor. He is Fulton the second. He has stolen the Promethean fire without meeting with the smallest vulture; he has discovered the invincible electric motor. The discovery of Mr. Allan has been submitted to the Academy of Sciences. Surely there are in that body some illustrious men who know that he has been successful; but too often such men, when assembled in conclave, do not see the inspiring Pentecostal flames which descend upon them. They repeat the words spoken by Fontanes in the Institute in 1811, *tous les vers sont faits;* they say, *tout est découvert.* The existing learned bodies have their *amour propre;* if there had been anything to discover they would have discovered it.

A NOVEL TARGET.

To the Editor of the Mechanics' Magazine.

Sir,—I find that sail or sack cloth, folded three or four times, and hung upon an extended rope or cord, answers extremely well as a target for rifle practice. I have used such a target for some time, and as the shot and percussion shells fall to the ground without injury, I can use them over and over again without losing one, or the trouble of recasting. Such a target would be found convenient and useful on board a man-of-war, for practice at sea. J. Norton.

CLARK'S SAUCER DOCKS FOR SHIPS.

To the Editor of the Mechanics' Magazine.

Sir,—An effective method of repairing ships, many of which are now built of such lengths as to set aside the use of the old docks, is a world-wide want. Will the Victoria Dock scheme at Blackwall meet this?

The lifting part of Mr. Clark's apparatus is simply the principle of Evans's Hydrostatic Dock, patented at New York in 1831. (See "Weale's Quarterly Papers on Engineering, Lady-day, 1845, Part 7.") The patent for England was bought by Mr. Pitcher, then Secretary of the Royal Mail Company, who had elaborate working models sent over; but, not answering in America, it made no way here. Its defects arose from the flexibility of a ship rendering it dangerous to lift her by so many unconnected applications of power; and if this was found to be the case with common ships with clean swept holds, much more would it be so with steamers thrice the length, and with the great and concentrated weight of engines, &c., in a fabric as flexible as a waggoner's whip, where if, under this central pressure, any of those nervous and delicate hydraulics refused to act, deflection would take place unobserved for some time. Evans's plan seems preferable in detail, as all the vertical or lifting chains are connected with one vertical chain drawn by one hydraulic apparatus on each dock side, whereas this of Mr. Clark's has forty hydraulics.

The next defect arose from the impossibility of effective shoring; none could be applied to the sides as the ship was lifted, and no means of properly supporting the bilge were provided. Mr. Clark says this can be done when the ship is up, and in the daylight; but what of the twilight, while the ship is unsupported? and no ship is self-supporting. They are emphatically a "bundle of bits," because of the short shift of their timbers, and with the enormous weight of engines, &c., pressing, be it remembered, upon an inverted arch, what is to prevent great straining?

The experience gained in thus raising the tubular bridges avails nothing. Those tubes were self-sustaining, and the effort is simply to overcome dead weight—a matter simple enough; the docking of long ships, with their multiplicity of joints and connections easily deranged, is a vastly different thing.

Another objection is to floating docks *in toto*. At Marseilles, when I passed, the large floating dock was unused while four ships were hove down around her. Upon minute inquiry, I found that the mere undulation of the harbour caused the large surface to twist sufficiently to drive the cleats from the shore-heads, and that in rough weather it was dangerous.

The floating docks once at Portsmouth and Southampton confirmed this.

It may well be asked if the "saucer" (clever term) that is to carry the ship is to be 7 or 8 feet deep, why not make it sufficient for the draught of water, and pump it out? (a matter, when the ship has displaced her bulk of water, of little effort), and thus do away with the expense and danger of so many hydraulics.

The discussion of this matter may tend to mature an important project, or prevent futile speculation where serious outlay is a necessary concomitant.

I am, Sir, yours, &c.,

Thos. White, Jun.

Portsmouth, June 15, 1857.

THE NEW INDUCTION COILS.

To the Editor of the Mechanics' Magazine.

Sir,—Mr. Bentley's communication in your last Number requires but very little comment from me. The more I hear of his machine, the more I feel my claim to priority established.

On comparing the various statements made by Mr. Bentley and his friends, whose communications would all appear to bear the stamp of equal authenticity, I find such extraordinary discrepancies, that it is difficult for me to discover when Mr. Bentley's machine was really first constructed. When I was lecturing at the London Institution, a friend of Mr. Bentley's voluntarily informed me that he was well acquainted with the circumstances connected with the construction of his machine, and that it was commenced about June or July, and finished in August, 1856. I allude to this with great reluctance, but am nevertheless compelled to admit that the conflicting information furnished to me throws much doubt on the correctness of Mr. Bentley's statements. With regard to the precise mode of insulation of my machine, Mr. Bentley must be aware that I stated in London that I had used both oiled silk and gutta percha, and as to being at a loss to know the precise mode in which it was applied, every tyro would know that the only part in which it could be of any service would be between the layers of the secondary coil. But this is not the only feature of similarity between our machines; indeed I repeat, that the whole of the arrangements adopted by Mr. Bentley are almost identical with my own, and I may also add, that I had commenced supplying his friend, Dr. Noad, with parti-

culars of my experiments and investigations in January, 1856.

I remain, Sir, yours, &c.,
JONATHAN N. HEARDER.

28, Buckwell-street, Plymouth,
June 22, 1857.

[In Mr. Bentley's letter in our last No., p. 587, col. 1, line 23 from top, *for* "this," read "his."—ED. M. M.]

KINGSTON'S VALVES—INDUCTION COILS.

To the Editor of the Mechanics' Magazine.

SIR,—I should feel much obliged by your informing myself, among many others, what kind of valves the "Kingston Valves" are, that were alluded to in the debates in parliament, on the "Transit" being referred to. I also beg to thank you for the impartial and scientific account you gave of the "Transit" which was quoted in "The House." I have delayed writing as I expected to obtain information here among engine-makers, though no one I have asked seems to know anything about the name of "Kingston Valves."

In to-day's *Mechanics' Magazine* I read a letter from Mr. Bentley, in reference to the coil of Mr. Hearder, in which he states he has already described *how* he (Mr. B.) constructs his coils, so as to enable others to make such soils. Could you direct me *where* I can read such a description, or could you oblige many electricians here by transferring the description to your columns, always supposing the matter good enough for the purpose.

I am, Sir, yours, &c.,
MACHINIST.

Birmingham, June 20, 1857.

[The "Kingston Valves" are fitted to all those orifices through the ship's bottom which are in connection with the machinery. To the boiler they are invaluable. The valve is simply a conical valve, fitted to the conical hole in the ship's bottom, the larger part of the orifice being outside. To this valve is attached a spindle, which works perfectly tight in a stuffing-box; and the inner end of the spindle terminates in a cross handle, by which the valve can be pulled in or forced out. If the blow-off cock should set fast, which it is apt to do, the attendant has simply to pull the handle of this valve, and the orifice becomes closed, and the water is prevented from passing out of the boiler. These valves are equally valuable to the sea injection orifice; for if the sea injection-cock should leak, there is no necessity for docking the vessel to repair, as was formerly done. We have but to close the valve, and the sea-cock can be taken out and reground. (See "Main and Brown's Marine Steam Engine.")

Mr. Bentley's coil was described in the *Philosophical Magazine* for January of the present year. As it is short, we will endeavour to find space for it in our next Number.—ED. M. M.]

THE ARCHIMEDEAN BALLOON.

To the Editor of the Mechanics' Magazine.

SIR,—As I should be sorry to leave Mr. Pitter's last letter unanswered, wherein he asserts I misrepresented his statements on his Archimedean and paddle-wheel balloon, I willingly waive the resolution I formed and stated in my last letter, of not replying to any more letters on this subject, and beg leave to refer Mr. Pitter to his own letter, dated Saturday, 20th Dec., 1856, printed in the *Mech. Mag.*, wherein the following paragraphs appear:

"The leading features in the construction of the elongated balloon are these:

"1st. An elongated framework having four paddle-wheels arranged two a-breast; these paddle-wheels are so constructed as to beat the air only through a certain arc, which can be readily shifted so as to produce a propelling power in any direction in a vertical plane.

"2nd. An elongated screw is to be placed at the fore part of the elongated framework or hull."

Now I beg Mr. Pitter will compare his own words with my letter, and ascertain if he be correct in stating that I misrepresented him. I may not perfectly have understood what he meant by an arc; I took it to be a partial covering of his paddle-wheels, as I stated; and I believe I am fully carried out in that idea when I find he proposes "to shift the arc round, that he may produce a propelling power in any direction he pleases." If he has any other meaning for his words, I confess I cannot discover it, nor could even those to whom I applied for an explanation. But, after all, this is nothing but theory, which I say could never be put into practice, as an elongated balloon could never be balanced; for the slightest weight at one side would disturb its equilibrium at once, and the gas would then press to the other, and increase the difficulty, even with divisions as proposed, as would also the very action of the screw as paddle-wheels. So I think the question may now be considered pretty nearly set at rest; and I trust Mr. Pitter will hasten to acknowledge his obligation to me, as I believe he stated "he would feel much obliged to any person who could set him right, and thereby save his brains a deal of trouble." I must not take leave of the subject without remarking, that he states in his last letter that he admits his fourth letter on Practical

Aërial Navigation (the only one I had seen or heard of) did not indicate the existence of the three other letters" (he had written), and adds that, "so far there is *some excuse for*" *my* "*oversight.*" I think he must mean second sight; for, otherwise, I must again admit my inability to discover his meaning in this, as well as his elongated framework and arc covering to his paddle-wheels.

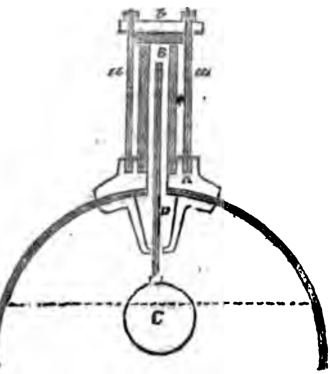
I am, Sir, yours, &c.,
AN AMATEUR.

London, June 22, 1857.

WATER GAUGES FOR BOILERS.

To the Editor of the Mechanics' Magazine.

SIR,—I being a constant subscriber to your valuable journal, and seeing a description of a water gauge said to be invented by Mr. T. T. Jopling, of Sunderland, and having paid some attention to these matters, I beg to hand you a sketch of a very similar, if not the same apparatus, which you have described as Mr. Jopling's. Many of these have been in use in the neighbourhood of Sunderland for years, and if Mr. Jopling will take the trouble to go to Bywell-on-Tyne, he will there see some of them at work, which were fixed by Mr. J. Slight, Leith-walk, Edinburgh. It is fair that Mr. Jopling should have credit for anything new which he may bring out; but attempting to claim as new anything that has been in public use for a number of years, seems to me to require correction. Herewith I enclose a sketch of the water gauge.



The fig. is a section of boiler and water gauge, as fixed by Mr. J. Slight, at Broomley, near Bywell. A is a metal socket to receive glass tube; B, the glass; C, the float; D, the rod, working loose in the tube and guide. *a*, *a*, are small bolts, which pass up outside the glass tube, and serve to screw down the cover, *b*.

By inserting the above, with the sketch, in your valuable Journal, you will oblige,

Sir, yours, &c.,
A PRACTICAL ENGINEER.

Newcastle-upon-Tyne, June 19, 1857.

SURFACE CONDENSATION.

To the Editor of the Mechanics' Magazine.

A mistake has occurred in the fourth clause of my communication, I think on the part of the printer, by adding the words "or below." The period runs thus:—"The patent proposes to effect a vacuum, let the steam be high or low, that is, if above *or below* the atmospheric pressure, by means unaided by the machinery, and in a way the most simple, natural, and efficacious."

My intention was to express that the steam, though it may be called low, must be over 15 lbs., at least at first. It is evident that if the steam at the beginning to work the machinery should not be sufficiently high to lift the valve in the closed vessel, the air the vessel may contain could not be expelled. The original force required to effect this will depend on the rapidity of condensation. Experience alone will determine this in each case. The air being expelled, and its pressure therefore removed from within the condensing pipe and closed vessel, the steam would afterward exert and assert its power at any pressure, high or low.

I am, Sir, yours, &c.,
J. B.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

SMITH, W. *Improvements in water level and pressure indicators and lubricators.* (A communication.) Dated Oct. 21, 1856. (No. 2470.)

This relates to apparatus for indicating variations of water levels in boilers and other vessels, for indicating the pressure of steam, water, or vacuum, and also for applying pressure for lubricating working surfaces, together forming an apparatus which may be described as "a pressure indicator and lubricator." The form and mode of indication preferred is that of a dial indicator.

SHAW, J. *Improvements in preparing the food of cattle.* Dated Oct. 21, 1856. (No. 2471.)

This consists in so combining a machine for reducing roots, with a machine for cutting hay, straw, gorse, &c., into chaff, that the reduced particles shall pass through a hopper common to both machines, and thereby become mixed before falling into a receptacle.

ATKINSON, R. D. *Improvements in preparing and coating metallic surfaces.* (A communication.) Dated Oct. 21, 1856. (No. 2472.)

This consists—1. In depositing copper or brass upon surfaces of iron previously prepared by being melted in conjunction with carbonic acid gas, and coating them with a brush or through the medium of galvanic agency. 2. In employing sulphate or sulphuret of lead as a coating to preserve surfaces of lead.

THOMSON, G. *Improvements in machinery for cutting or rending wood for laths and other uses.* Dated Oct. 21, 1856. (No. 2474.)

This machinery consists of an endless band of thin steel carried by two wheels, one of which receives motion from a drum on a crank axis. The wheels have teeth on their peripheries which take into holes in the endless band. The wood to be cut is cut into proper lengths, and fed into the machine between two upright screws, and are moved a proper distance (after the passage of each cutter) by a lever or otherwise. The cutters are free to accommodate themselves to the irregularities of the grain of the wood.

NEWTON, W. E. *Improved machinery for rolling and forging iron or steel.* Dated Oct. 21, 1856. (No. 2476.)

This invention consists—1. In the employment of revolving rolls, one being allowed to approach or recede from the other, its position and pressure being entirely under the control of the operator. 2. It has reference to a machine for bending iron, particularly applicable to shaping horse-shoes. 3. It consists in improvements in clamps for punching machines; and 4. In a peculiarly constructed machine for welding metals.

NEWTON, A. V. *An improvement applicable to the reefing, furling, and unfurling of sails.* (A communication.) Dated Oct. 21, 1856. (No. 2477.)

This relates to the reefing and furling of sails upon an extra yard, by raising and lowering the upper yard. The extra yard is placed about midway between the upper and lower yards, and it is composed of two pieces, so arranged that the sail may pass between them. Connected with the double yard are certain devices which roll the sail up on it. so that the sail is reefed and furled in two directions from the middle.

ERMEN, G. *Certain improvements in machinery or apparatus for the finishing and treatment of yarns or threads.* Dated Oct. 22, 1856. (No. 2480.)

This consists—1. In the use of uneven or roughened surfaces for imparting friction to the yarn or thread during the polishing and finishing. 2. In the use of rollers, or cylinders, or other convenient apparatus, having surfaces grooved, fluted, or corrugated in the direction of their length, for passing the polished or finished yarns or threads between, in order to overcome the harshness of the size, and give softness to the yarn or thread.

WALTON, F. *Certain improvements in the manufacture of brushes.* Dated Oct. 22, 1856. (No. 2481.)

This consists — 1. In manufacturing brushes with a hollow back or mounting containing a cushion to give elasticity to the bristles or wires of the brush.—2. In making the backs or mountings of brushes (containing cushions) of gutta percha, either by itself or in combination with tortoise shell, ivory, &c. 3. In making the backs or mountings of brushes (containing cushions) of sheet metal or alloys, or metal stamped to the required shape. 4. In certain modes of putting together the component parts of a brush. 5. In setting the wires of brushes in india rubber.

POTTS, G. C. *The application of certain materials to the cleaning of casks.* Dated Oct. 22, 1856. (No. 2482.)

Claim.—The use and application of gravel, shingle, broken stones, sand, and other mineral grit, for, and to, the cleaning of casks.

PORTER, J. F. *Improvements in the manufacture of bricks and other articles of clay and brick-earth, or of the like materials.* Dated Oct. 23, 1856. (No. 2485.)

This invention cannot be described without engravings.

JOHNS, G. E. *The application and adaptation of an optical or stereoscopic arrangement in the manufacture of boxes.* Dated Oct. 23, 1856. (No. 2486.)

The patentee applies an optical or stereoscopic apparatus to ornamental and other boxes.

BREMER, J. C. *Improvements in propellers.* Dated Oct. 23, 1856. (No. 2487.)

This consists of a very complicated arrangement of cog-wheels, &c., in connection with paddle-floats.

MACDONALD, J. *Improvements in regulating the supply of oil or other liquids, applicable to lamps, gas meters, and other useful purposes.* Dated Oct. 23, 1856. (No. 2488.)

A description of this invention would not be intelligible without reference to the drawing, and this is so roughly executed that reference to it would be most unsatisfactory.

BROUGH, N. *Improvements in dress fastenings.* Dated Oct. 23, 1856. (No. 2489.)

This invention cannot be described without engravings.

BISHOP, A. D. *Improved apparatus for facilitating the finding and raising of vessels*

and submerged articles. Dated Oct. 23, 1856. (No. 2490.)

The patentee proposes to use a floating rod or wire kept to a given height from the bed of the sea clear of stones, &c., but sufficiently low to come in contact with, say, the mast of a ship, and thus indicate its presence. When the location of the ship is made known, he sinks chains at opposite extremities thereof, and proceeds to gather them taut in order that they may grip the ship. For drawing the chains together, he employs a novel apparatus which cannot be described without engravings.

HORREX, T. *Improvements in fastening buttons and other similar articles on to garments and other things.* Dated Oct. 23, 1856. (No. 2491.)

This consists in the employment of a double catch capable of piercing the garment, and then by passing into or through parts of the button to attach itself thereto and hold it.

WALLEY, J. *Improvements in the means of preventing explosions of steam boilers.* Dated Oct. 23, 1856. (No. 2492.)

This consists in certain mechanism in connection with a float, so constructed that when the water in the boiler has got below the proper level, a valve in the steam pipe is closed by the descent of said float, thereby stopping the engine, and simultaneously closing a damper (also connected with the float) in the flue, thus causing the fire to die out.

DUNNICLIFF, J. D., and W. DEXTER. *Improvements in warp machinery.* Dated Oct. 23, 1856. (No. 2493.)

This consists in causing the warp or guide bars in addition to shogging or moving endways, to cause the guides or lapping instruments of one guide-bar to pass between those of another, so as for a time to reverse the positions of the guides, and from time to time to change the positions of the respective guide-bars so that the guides of one bar may pass between different spaces of the other.

DESACHY, L. A. *Improvements in producing architectural mouldings, ornaments, and other works of art formed with surfaces of plaster or cement.* Dated Oct. 23, 1856. (No. 2494.)

The plaster or cement is applied to the interior surface of the mould in a thin coating, and whilst it is still plastic a coating of woven fabric is applied to the interior surface of the plaster. To facilitate the fixing of such mould surfaces, wires are, when required, laid into and retained between the layers of fabric.

ATHAWES, E. A. *An improvement in the construction of forks for forking land.* Dated Oct. 23, 1856. (No. 2495.)

The central tines are set forward, and the two outward tines are in a plane behind the plane in which the central tines work. The tines are equidistant from each other, and the central tines longer than the outward, and a curve at the top of the central tines answers the double purpose—1. Of lifting the soil to the right and left hand in an arched manner, so that the soil will not readily relapse to its former position; and, 2. The under part of the top of the central tines, on coming in contact with the ground, forms a good leverage when the fork is in use.

BAILEY, I. *Improvements in machinery for spinning wool, cotton, alpaca, mohair, and other fibrous materials.* Dated Oct. 24, 1856. (No. 2497.)

This present invention consists of improvements upon the invention for stopping or suspending the onward progress or supply of the roving in throstle frames which is described in the specification of a patent granted to J. S. Bailey and I. Bailey, 20th Nov., 1851.

WHITE, G. *An improvement in the treatment of grain in order to produce starch and spirit therefrom.* Dated Oct. 24, 1856. (No. 2498.)

This consists in first treating raw grain in a separate vessel with water or steam, at such a temperature as will coagulate the diastase in malted grain, or at any lower temperature; then reducing the temperature to the degree to which malted grain may be subjected. After which the mass is mixed with malted grain, and fermentation and distillation are carried on as usual.

WOODFORD, W. *The prevention or cure of smoky chimneys.* Dated Oct. 24, 1856. (No. 2500.)

This consists in forming apertures in the sides of a chimney near the top, or the sides of a cowl on the chimney (the top of the chimney or cowl being closed), and in placing in each of the apertures a three-leaved vane turning upon a vertical spindle, one leaf of each vane projecting outwards from the face of the chimney or cowl, and the other two being within it.

STRUTHERS, R. *Improvements in machinery or apparatus for transmitting motive power.* Dated Oct. 24, 1856. (No. 2501.)

This consists of toothed wheel gearing especially adapted for communicating the motion of the engine to the screw propeller, but which is also applicable for other purposes where motive power is to be transmitted.

HOLDEN, H. A. *Improvements in furniture for railway and other carriages, and which said improvements are also applicable as a means of finishing or ornamenting the iron parts of harness and other articles made of iron to which such mode of finish or ornament-*

ing has not heretofore been applied. Dated Oct. 24, 1856. (No. 2503.)

The object of this is to ornament or finish the articles named above, by coating them with glass (either in one or more colours) conjointly or singly.

MANGIN, L. A. *A self-acting door-spring.* Dated Oct. 24, 1856. (No. 2504.)

This door-spring closes the door to which it is applied in any position, except when the door is opened its full width. The spring cannot well be described without engravings.

BENSON, W. *Improvements in apparatus for drying grain, seeds, and other substances.* Dated Oct. 25, 1856. (No. 2508.)

The heat or drying action is derived from steam, which is made to pass into a case or chamber, upon the surface or inside of which, if it be of a cylindrical form, the substance to be dried is placed. According to one modification, the substance to be dried is made to pass slowly along a channel or conduit, by the aid of hand-ropes or otherwise, and this channel is heated by a current of steam. Other modifications are used.

BACHHOFFNER, G. H. *Improvements in glass shades for gas and other artificial lights.* Dated Oct. 25, 1856. (No. 2511.)

This relates—1. To those globes or shades placed over lights, which are usually ground or otherwise ornamented, and it consists in forming the shade with the opening for the introduction of the gas pipe at the side. The 2nd part relates to shades for night lights. It consists in placing the lights within two glasses, first a short glass shade or chimney, and second a large one which is closed at the upper part, but is furnished with perforations in its holder or gallery for the escape of the hot and vitiated air at the bottom. The air passes first up within the inner glass to supply combustion, and, escaping into the dome of the outer glass, is conducted down and out of the lower part.

OSMAN, H. F. *An improved contrivance for distending the skirts of ladies' dresses, and preserving the required form and shape thereof.* (A communication.) Dated Oct. 25, 1856. (No. 2513.)

The upper ends of three or more strips of spring steel, bent as required, are drawn in at the waist, thereby causing their lower or pending portions to spring proportionally off, and to carry with them a light flexible framework.

FERREY, B. *An improvement in producing ornamental plastering or stucco-work.* Dated Oct. 27, 1856. (No. 2515.)

Ornamental pattern-plates are formed similar to stencil plates, but sufficiently strong to admit of their being pressed into the finishing coating of plaster, and the edges of the pattern are inclined so as to enter freely into the plaster, and come away without injury to the impressions.

ALLAN, T. *Improvements in the permanent way of railways.* Dated Oct. 27, 1856. (No. 2519.)

This consists in constructing each line of rails in two parts, bolted together and united so that the lengths of each half of the rail break joint with the lengths forming the corresponding half. Each length has two flanges, one to lie level with the ballast and form the sleeper, and the other to descend vertically into it. At the junction of the lengths of half rails the small ends are bolted to the corresponding half (to complete the rail) at the broadest and strongest part thereof in both directions. Rails thus constructed form of themselves perfect fish-joints. It will be necessary at intervals to bolt the two lines together by means of the tie-bars to ensure their parallelism.

FENTON, J. *An improved method of and signal apparatus for preventing accidents on railways.* Dated Oct. 27, 1856. (No. 2520.)

This invention was described and illustrated at page 457 of No. 1762, for May 16, 1857.

DOGNIN, M. *Improvements in machinery for making lace or net.* Dated Oct. 27, 1856. (No. 2523.)

This relates to a novel arrangement of warp machinery, whereby the warp threads may be crossed to form any desired pattern by the aid of Jacquard apparatus, and when so crossed secured by means of tie threads worked into chain stitches.

BRODIE, W. *Improvements in the manufacture or production of roofing tiles.* Dated Oct. 28, 1856. (No. 2524.)

The clay is prepared in a pug mill, from which it is made to exude through a die of a horseshoe form. The issuing horseshoe-shaped stream of clay is cut into lengths forming blanks to be subsequently moulded into the finished roofing tile.

RAGON, A. E. *Improvements in apparatus for indicating and recording the speed of ships.* (A communication.) Dated Oct. 28, 1856. (No. 2526.)

In this invention a cylinder is used in which works a piston exposed to the pressure of the water as the ship passes through it. At the back of the piston is a spring, which becomes compressed by the resistance of the water; the position of the piston in the cylinder depends on the speed of the ship. The piston is connected by a chain and rod passing by a tube into the ship. The motion of the piston is communicated to an indicator, and the speed is recorded by a

pencil in contact with a surface receiving regular motion by clockwork.

LOSH, W. S. *Improvements in the preparation of size, which may also be used as a waterproof varnish or coating.* Dated Oct. 28, 1856. (No. 2527.)

This consists in preparing from rosin, resins or stearine, or a mixture of the two, substances suitable for sizeing or waterproofing purposes. The above materials are first acted upon with an alkaline solution, and thus rendered soluble; such solutions are then treated by chloride of lime, or other chloride, and an acid or solution of alum.

MARIE, J. L. *Improvements in raising, propelling, and forcing water and other fluids, and in obtaining motive power.* Dated Oct. 28, 1856. (No. 2528.)

This consists in certain means of and apparatus for raising, propelling, and forcing fluids, and obtaining motive power by the agency of compressed air, acting in connection with a vessel divided into two compartments immersed in the water to be raised. This vessel is provided with suitable valves and tubes, and is connected with a peculiarly constructed tap, worked by a lever or balance handle, actuated by stalk valves.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

SMITH, S. *Certain improvements in furnaces.* Dated Oct. 21, 1856. (No. 2469.)

These consist in the construction of a second or dipping bridge within the furnace, and in advance of the ordinary bridge, such new bridge being reversed, or so formed as to project the flame downward, and check it in its passage to the back of the furnace.

WHITEHOUSE, E. O. W., and J. C. LAWS. *Improvements in tools for soldering metals.* Dated Oct. 21, 1856. (No. 2473.)

The soldering end of the improved tools is heated by a jet of gas brought to the soldering tool by means of a flexible tube.

PATTINSON, H. L. *Improvements in the treatment of certain salts and oxides of manganese.* Dated Oct. 21, 1856. (No. 2475.)

The inventor takes a soluble salt of manganese, dissolves it in water, and adds an earthy or alkaline precipitant, by which he obtains oxide or mixed oxide of manganese, which he separates, washes, and dries, and exposes for some time to a heat considerably below the melting point of tin. By this treatment he obtains a larger proportion of peroxide of manganese than the precipitate originally contained, so much so as to render its application useful in the arts.

WEBSTER, G. and J. *Improvements in the means of opening and closing the slide valves of engines worked by steam or other power.* Dated Oct. 21, 1856. (No. 2478.)

This consists in arranging certain mechanism within the cylinder of an engine, instead of at the outside thereof, thereby dispensing with the use of an eccentric and rod, as commonly employed, for actuating the slide.

LIEBMANN, C. H. J. W. M. *An improvement in purifying water.* (A communication.) Dated Oct. 22, 1856. (No. 2479.)

This consists in applying carbonic acid gas and hydrate of lime to the water to be purified.

HARRISON, C. W. *Improvements in the insulation and protection of electric conductors.* Dated Oct. 23, 1856. (No. 2483.)

These consist in insulating the conducting medium by covering it with alternate layers of gutta percha and fibrous material, or by winding around it separate coverings of gutta percha and caoutchouc, cloth, or felt, and causing the successive layers to unite by heat and compression; he likewise covers one conducting medium by winding another (a smaller one) spirally round it, one or both being covered with a fibrous material. He also protects conductors, especially for laying down under ground in hot countries, by surrounding them with a fibrous covering and then enclosing the covered medium in a wrapper of lead. And he protects electric conductors when contained in a metal rope or cable, by passing such rope or cable through a composition of tar and cement, or other mixture, which will fill the interstices between the wires, and form a concrete when the cable is laid down.

GRAY, T. *An improved drying-apparatus.* Dated Oct. 23, 1856. (No. 2484.)

The inventor erects a furnace, without any flues, and inserts in openings in either of the sides thereof doors made to rise and fall in grooves. He fixes a double line of metal rails in the furnace, opposite to each of the sliding doors, and reaching to the opposite side. He then constructs a carriage on wheels to run upon the rails, and makes a wire-work structure in the form of a hollow cylinder, with a convenient opening in the sides for putting therein and removing therefrom the materials to be dried. One such frame is to be attached to each of the carriages, so that the frame may easily revolve, for the purpose of turning the material to be dried, by a handle fixed to the wire-work frame, by passing the same through a hole in each of the sliding doors.

GWYNNE, J. E. A. *Improvements in the manufacture of carbon or charcoal powder for various useful purposes.* Dated Oct. 24, 1856. (No. 2496.)

This consists in the manufacture from raw peat, boghead coal, and lignite, of a new carbon or charcoal powder, to be used as a substitute for ivory black, vegetable black, charcoal for gunpowder, &c., &c.

BROOMAN, R. A. *An improved oil for burning in lamps and an improved burner and chimney.* (A communication.) Dated Oct. 24, 1856. (No. 2499.)

The base of this improved oil is fixed oil of resin; by mixing with it some of the various white vegetable or animal oils, an oil is obtained capable of being burnt, and of giving greater light than is obtained from animal or vegetable oils alone. The improved burner (for burning this oil) is composed of three tubes suitably arranged.

MILLS, W. *Certain improvements in apparatus for cleansing or removing the soot from chimneys.* Dated Oct. 24, 1856. (No. 2502.)

The inventor uses a vertical shaft and a socket with a pulley at the top, and a hollow at the bottom for the handle, and on this shaft metallic plates are secured by hinge joints, and on the outside of the plates he attaches cords which work over the pulley at the top, and by the aid of the cords when the apparatus is pushed up to the top of the chimney the user may raise the flaps into a horizontal position, so that on pulling the apparatus down, the chimney is effectually cleared.

BAXTER, S. *Improvements in chain wheels, or barrels and stoppers to be used for raising and lowering weights by means of chains.* Dated Oct. 24, 1856. (No. 2505.)

This consists in constructing the wheel or barrel with curved recesses in the sides for receiving the links of the chain edgeways, and alternate flat spaces to receive the links flatways. In combination with these holding surfaces the inventor employs self-acting guide stoppers and rollers.

ANCIAUME, C. *Improvements in musical organs, both sedentary and portable.* Dated Oct. 24, 1856. (No. 2506.)

The improved organs cannot be described without engravings.

ERNST, G., and W. LORBERG. *An improved mode or method of raising or producing designs, patterns, or impressions on the surfaces of plates, blocks, or rollers, and transferring or imparting the same to paper, parchment, woven fabrics, leather, or other similar materials.* Dated Oct. 25, 1856. (No. 2507.)

These consist in making original drawings, by executing them directly, either on a metal plate or on transfer paper with chalk or lithographic ink. If copies only are required, the inventors transfer them with the transfer ink to the metal plate. They then pass this plate through a solution of some alkali or acid for cleansing it, and protect it at the back part by some common varnish, and then place it in a solution of the same metal as itself and connect it to a galvanic apparatus. By this process the unprotected parts of the plate are quickly dissolved, leaving the design or subject in relief.

FARRINGTON, C. J., and W. COMBER. *Improvements in means or apparatus for giving alarm in case of attempted burglaries.* Dated Oct. 25, 1856. (No. 2509.)

A series of rods are applied to the interior of the door or other place to be guarded. There is also a frame capable when pressed of releasing the bars from their stops, and thereby permit them to slide endwise by springs or other means. The object of this is, that supposing a centre bit be employed, so soon as it presses upon the frame, it will release the bars, which will then slide and set the alarum in motion. Also the improvements apply to the application of means to the key-hole of a door in such manner that when a key or other instrument is introduced thereto after such means are applied, a bolt will cause the releasing of the alarum used.

SEXTON, J. *Improvements in the construction of caustic holders applicable also to the holding of leads, chalks, and other marking materials.* Dated Oct. 25, 1856. (No. 2510.)

This relates to telescopic holders, from which caustic, &c., is protruded by a propeller in the rear thereof. The holder is formed of two parts, one to receive the caustic and the other the propeller. These two parts the inventor sometimes makes tubular, the propeller part to fit on to the rear end of the other (which may be slit to give it a spring), and by sliding over it to force the propeller against the caustic and push it forward.

HOCHSTAETTER, H. *Improvements in obtaining instantaneous light.* Dated Oct. 25, 1856. (No. 2512.)

This is effected by combining phosphorus with iodine, which produces a non-inflammatory mixture for a rubbing surface for matches. The matches are composed of wood dipped in sulphur or wax, and then in a mixture of nitrate or chloride of potass, red lead, oxide of iron, and glue or gum.

BROWN, T. *Improvements in capstans and windlasses.* Dated Oct. 25, 1856. (No. 2514.)

In this invention the pawls hold at each end, and move on a central axis, and as the pawls are placed for the time being, so will be the direction in which the barrel of the capstan will turn, and when the pawls are central, the capstan barrel will be free to rotate in either direction. The position in which the pawls are for the time being held is governed by a circular plate or ring,

having eccentric or curved surfaces, one to each pawl, and the pawls have each projections which rest against and are acted on by the eccentric and curved surfaces on the ring or plate. The improvements in windlasses consist of applying to the flanch of a windlass barrel an instrument to lift the chain from the holding parts of the flanch, so as to admit of the chain running out without the barrel of the windlass being reversed in its action.

Birkin, J. *Improvements in dressing and cleaning wheat and other grain.* Dated Oct. 27, 1856. (No. 2516.)

The inventor constructs a revolving cylinder supported by bearings in a framework, and covered with flannel. There is a hopper with a pipe attached placed over it, into which the grain is put. Underneath the cylinder, and in contact with the flannel, he fixes a brush for removing any extraneous matter. At or above the centre of the cylinder, and in contact with it, he places a brush revolving in the opposite direction to the nap of the flannel, for raising the nap.

PROVISIONAL PROTECTIONS.

Dated March 21, 1857.

804. Bewicke Blackburn, of Clapham-common. Improvements in the manufacture of pens.

Dated April 23, 1857.

1156. John Thomas Way, of Welbeck-street. An improvement in the manufacture of soap.

Dated May 5, 1857.

1264. Juste Herrero, of Paris, gentleman. An improved inking and stamping machine.

Dated May 7, 1857.

1292. William Charles Aberdein, of New North-road, Islington, commercial traveller. The tubular elastic fastener and stud for gentlemen's shirt collars and wristbands, and other garments.

Dated May 8, 1857.

1302. Caleb Tayler, of Deptford, gentleman. Improvements in the manufacture of sheets of material suitable for covering floors, and for other useful purposes.

Dated May 27, 1857.

1499. Randal Cresswell, of Conduit-street, Regent-street, merchant. A new article, to be called 'typha velvet,' suitable for carpets, furniture hangings, wearing apparel, and other useful purposes.

1506. Thomas Grahame, of Upper Seymour-street, Portman-square. Improvements in inland navigation.

Dated May 30, 1857.

1528. Louis Heinemann and Arnold Heinemann, of Manchester. Improvements in those parts of printing machines, called "doctors."

1537. Thomas Wilson, of Chiswick, schoolmaster. Improvements in floating bodies used in washing machines.

Dated June 3, 1857.

1557. Peter Rothwell Arrowsmith, of Bolton-le-Moors, cotton spinner, and Robert Caunce, of the same place, manager. Certain improvements in machinery for carding cotton and other fibrous materials.

1558. Paul Emile Chappuis, of Fleet-street, reflector manufacturer. Improvements in stereoscopes.

1559. Edmond Roy, of Paris, civil engineer. Improvements in the construction of railway vehicles for the special purpose of allowing them to run freely on short curved lines.

1560. Charles Robertson, of London, master mariner. An apparatus for cleaning the bottoms of iron ships while afloat.

1561. Samuel Lees, James Lees and Frederick Lees, of Rochdale. Improvements in machinery for warping cotton, worsted, and other fibrous substances.

1562. William Jones, of Swansea. Improvements in heating and compressing artificial fuel.

1563. Samuel Morand, of Manchester, gentleman. Improvements in apparatus used for stretching and drying fabrics.

1564. George Remington, of Hereford-square, Old Brompton, engineer, and John Barton Balcombe, of Sutherland-terrace, Brixton, gentleman. Improvements in locomotive engines applicable to common roads.

1565. George Deeley, of West Bromwich, Stafford, ironfounder. Improved means for preventing the explosion of steam boilers.

1566. Richard Archibald Brooman, of 166, Fleet-street, London, E.C., patent agent. Improvements in gas burners. A communication.

1567. John Jobson, of Dover, engine driver. Improvements in oil cans or feeders.

1568. William Barr, of Panton-street, Haymarket, tailor. Improvements in actual measurement for "delineating garments." A communication.

Dated June 4, 1857.

1569. Laurent Prosper Therrin, of Grand Rue Dieppe, department of Seine Inferieure, France. Improvements in railway breaks, applicable to railway carriages, called railway lever breaks.

1570. Henry Constantine Jennings, of Great Tower-street, practical chemist. Improvements in the manufacture of paper, papier maché, and other similar substances.

1572. Victor Blumberg, of Notting-hill, gentleman. Improvements in the manufacture of billiard tables.

1573. William Miller, of Buckingham-street, Strand. Improvements in the manufacture of sugar, and in the apparatus used therein.

1574. William Harding, of Forest-hill, Kent, gunmaker. An improvement in pistol holsters.

1575. Thomas Welcome Roys, of Southampton, United States, master mariner. Improvements applicable to fire-arms.

1576. James King, of Oxford, mercer. Improvements in the manufacture of shirts.

1577. Thomas Latham Boote and Richard Boote, of Burslem, Stafford, potters. Improvements in the manufacture of ornamental pottery and articles made from clay and other like plastic materials.

Dated June 5, 1857.

1578. Robert Hanham Collyer, M.D., of Park-road, Regent's-park. An improved mode of preparing the residue of beet root, mangel wurtzel, and other species of the genus beta left in sugar making and distillation, to be used as material in making paper, papier maché, millboard, and other similar manufactures.

1579. Richard Roberts of Heaton Norris, Lancaster, machine maker, and Wright Shaw and Sa-

muel Shaw, of Geecross, Chester, weavers. Improvements in machinery for weaving and folding fabrics.

1580. Edouard Roussille, of Jurançon, France. Improvements in manufacturing stearic acid.

1581. Joseph Etienne Marie Jean Clair, of Annonay, France, architect. Certain improvements in propelling on water and in the air. A communication from J. Robatel, of Lyons.

1582. Thomas Wheelhouse, of Salford, Lancaster, and John Greenwood, of Pendleton. Improvements in ventilating vehicles or carriages in motion.

1583. Henry Schmidt, of Surrey-street, Strand. The new cork roller for lithographic printing. A communication.

1584. George Collier, of Halifax, York. Improvements in preparing printed or parti-coloured yarns for manufacture into fabrics.

1585. Ferdinand Jossa, of St. Helen's colliery, near Bishops Auckland, Durham. Improvements in uniting iron and steel.

1587. William Edward Newton, of Chancery-lane. Improvements in the manufacture of paper, papier maché, cardboard, and other similar articles. A communication from M. Voelter.

1589. Edmund Knowles Muspratt, of Liverpool, and Balthasar Wilhelm Gerland, Ph. D., of Manchester. Improvements in treating waste liquors produced in the manufacture of chlorine, and in separating nickel, cobalt, and copper, from liquors containing them in combination with manganese and iron.

Dated June 6, 1857.

1590. Thomas George Shaw, of Blackheath, merchant. Improvements in bedsteads. A communication.

1591. Frederick Oldfield Ward, gentleman, of Cork-street, Burlington-gardens, and Frederick Wynauts, captain of engineers, of Ixelles-lez-Bruxelles. Improvements in manufacturing manure and obtaining accessory products.

1592. Hiram Powers, of Florence, Italy, sculptor. An improved machine for punching, stamping, or cutting metals and other substances.

1593. Rudolph Dinglinger, of Berlin, Prussia, engineer. Improvements in pumps, which improvements are also applicable to steam engines.

1594. Edward Hirst Hudson, of Burley, York, worsted spinner. Improvements in means or apparatus to prevent driving straps lapping on the shafting when they shift off their pulleys.

1595. Henri Joseph Noé, of Paris, frame maker. Improvements in portable stereoscopes.

1596. Joseph Rogers, of Bartholomew-close, London, gentleman. Improvements in machinery for winding or folding drapery and other like goods.

1597. Edward Edwards, of Englefield-terrace, Kingsland, agent. An improved mode of fastening stair rods and other rods.

1598. Amory Fairbanks Sherman, of Roxbury, Massachusetts, civil engineer. Improvements in machinery for breaking, hatchelling, roving, spinning and tarring hemp, flax, manilla, or any fibrous material or materials.

1599. Alfred Jean Vincent Dopter, of Paris, printer. Improvements in ornamenting cloth, wood, metal, leather, and other surfaces.

Dated June 8, 1857.

1601. Donald Bethune, of Cambridge-terrace, Hyde-park, esquire. Improvements in apparatus for preventing or consuming smoke in furnaces and chimneys.

1602. John Brown, of Golds-green, West Bromwich, Stafford, mill manager. Certain improvements adapted to the prevention of steam boiler explosions.

1603. Edgar Brooks, of Birmingham, manufacturer. A new or improved manufacture of gun barrels, and other articles of like manufacture.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1658. Thomas Turner, of Wolverhampton, ironmonger. Improvements in apparatus to be employed as an alarm and detector in cases of burglary. Dated June 12, 1857.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," June 23rd,* 1857.)

385. A. Chambers and W. H. Champion. A mode of working railway breaks.

386. G. Bedson. Improvements in coating metal with metal and metallic compounds.

399. A. C. Dandraut. Preserving organised animal and vegetable matters, especially alimentary substances.

401. W. G. Armstrong. Improvements in ordnance.

403. J. Poole. Improvements in safety or other valves, and in mechanical appliances thereto.

406. G. C. Potts. Improvements in cleansing casks.

419. G. Gimson. Certain improvements in steam engines.

426. D. A. Lamb. Improvements in water closets, and in apparatus connected therewith.

427. W. S. Clark. Improvements in machines for grating substances. A communication.

429. N. C. Smith. Improvements in the disc engine.

430. M. W. Hallett. Improvements in apparatus for securing window and other openings in buildings.

431. J. Lawson and S. Cotton. Improvements in machinery for roving, spinning or twisting flax, cotton, wool, and other fibrous substances.

432. G. Hardstaff. Improvements in apparatus for actuating and applying the breaks of carriages used on railways, and for coupling such carriages.

433. R. Houchin. Improvements in alarums.

436. J. Williams. Improvements in apparatus for lowering and stopping anchor chains on board ships and for other similar purposes.

444. C. R. Moate. Improvements in the permanent way of railways.

445. W. Cooke. Improvements in apparatus for ventilating.

450. T. Newcomb. Improvements in machinery for manufacturing nails.

463. E. Alcan. Improvements in machinery for twisting, doubling and spinning cotton, silk, and other fibrous materials. A communication.

467. F. B. Houghton. Improvements in the preparation of materials used in the manufacture of paper.

480. S. Dyer. Certain improvements in ships' windlasses, capstans, bumpkins, gins, and cranes.

483. G. F. L. Meakin. An improved method of applying breaks to railway carriages.

499. J. Combe. Improvements in the construction and driving of power looms, in the formation of shuttles, and in the winding and arrangement of weft, parts of which improvements are applicable to other purposes.

508. J. Whitehead. Improvements in boilers.

540. J. Robinson. Improvements in the stages used in green-houses and hot-houses.

579. W. H. Thornthwaite. Certain improvements in barometers.

639. G. W. Dyson. Tilting iron and steel or any other malleable substance by perpendicular motion.

661. W. Petrie. Improved means of, and apparatuses for, creating or increasing draughts and currents.

749. W. E. Newton. Certain improvements in folding window blinds and shutters. A communication.